

INFRASTRUCTURAL SURVEY REPORT
FOR
THE DEVELOPMENT
OF
THE NUSANTARA CEMENT PLANT
IN
THE REPUBLIC OF INDONESIA

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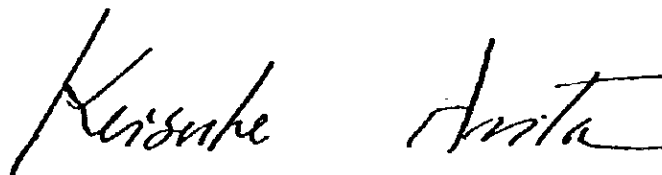
PREFACE

The Japanese Government decided to conduct a survey on the development of infrastructure related to the Nusantara cement plant Project and entrusted the Japan International Cooperation Agency with the survey. The J.I.C.A. sent to Indonesia a survey team headed by Mr. Hironichi Kono from August 31 to September 29, 1980.

The team, in consultation with the officials concerned of the Government of the Republic of Indonesia, conducted a field survey (in Central Jawa Province area). After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

Handwritten signature of Keisuke Arita in black ink, consisting of two parts: 'Keisuke' on the left and 'Arita' on the right.

February, 1981

Keisuke Arita
President

Japan International Cooperation Agency

LETTER OF TRANSMITTAL

January, 1981

Mr. Keisuke Arita, President,
Japan International Cooperation Agency.

Dear Mr. Arita,

It is my great pleasure to submit herewith the study report on the improvements of harbor facilities and relevant infrastructure facilities essential to the expansion of P. T. Semen Nusantara's factory (cement factory), which is situated in the Cilacap Area in Jawa Island of the Republic of Indonesia.

At the request of the Japan International Cooperation Agency, the Study Team was organized with 4 members from Mitsui Consultants Co., Ltd. and 2 members from Onoda Engineering Co., Ltd., and during the period of August, 31 1980 and September 29, 1980, site reconnaissance and field surveys (soil survey, topographic survey, and marine phenomenon survey) were conducted of the Cilacap Area in the Republic of Indonesia, and simultaneously, collection of data was made through Governmental authorities concerned in Jakarta during the period.

The main subject of this project is to make appropriate recommendations by being greatly helpful to the smooth operation of P. T. Semen Nusantara's factory by improving relevant facilities to become essential to the expansion of the factory, and also, by conducting investigation and study technically and economically to contribute to the promotion of welfare of the Area's surrounding population and to the development of the Area's economy.

Presently, the Cilacap Area is changing to an industrial area from

an agricultural area with the Industrial Estate Scheme; however, despite the Area's large labor population, this Scheme has made no progress so far due to the shortage of industrial water supply, the shortage of handling capacity of on-shore and harbor facilities, etc., and at the present stage, the plans for securing industrial water supply and improvement of roads are being taken up by other Governmental Offices.

At this time, in the event that the expansion of P. T. Semen Nusantara's factory is materialized and improvement of harbor facilities are made for partial public utilization in the Area, the project will not only promote the welfare of the Area's population and contribute to further economic development such as enhancing labor employment, but will be expected to play a great role in increasing the capacity of Cilacap Port's harbor facilities.

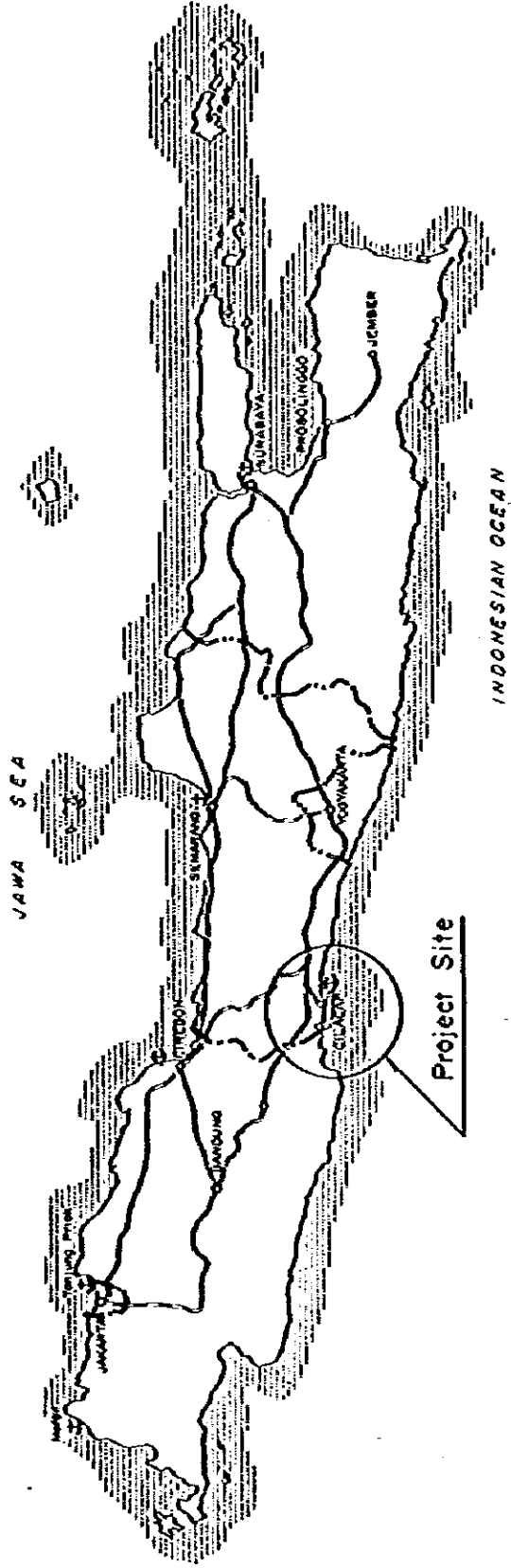
With the submission of the report, I would express my deepest appreciation to the various Offices concerned of the Government of the Republic of Indonesia, the Japanese Embassy in the Republic of Indonesia, the Ministry of Foreign Affairs, the Ministry of International Trade and Industry, the Japan International Cooperation Agency and many others for every cooperation extended to the Study Team.

Sincerely yours,

Hiroichi Kono

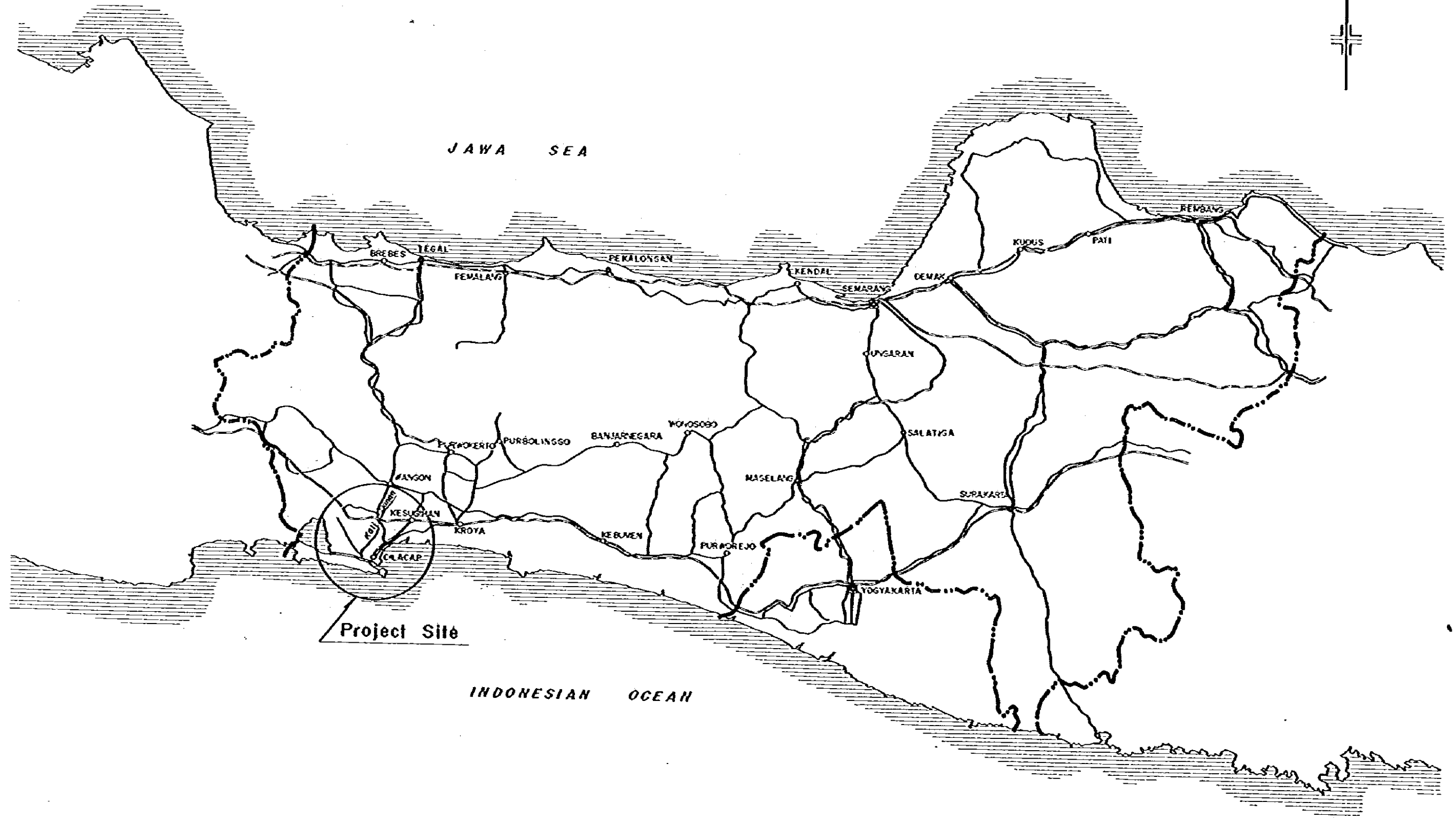
Hiroichi Kono, Leader,
Japanese Study Team for the
Improvement Plan of P. T. Semen
Nusantara's Relevant Harbor Facilities
in the Republic of Indonesia.

**Project Location Map
(Jawa Indonesia)**

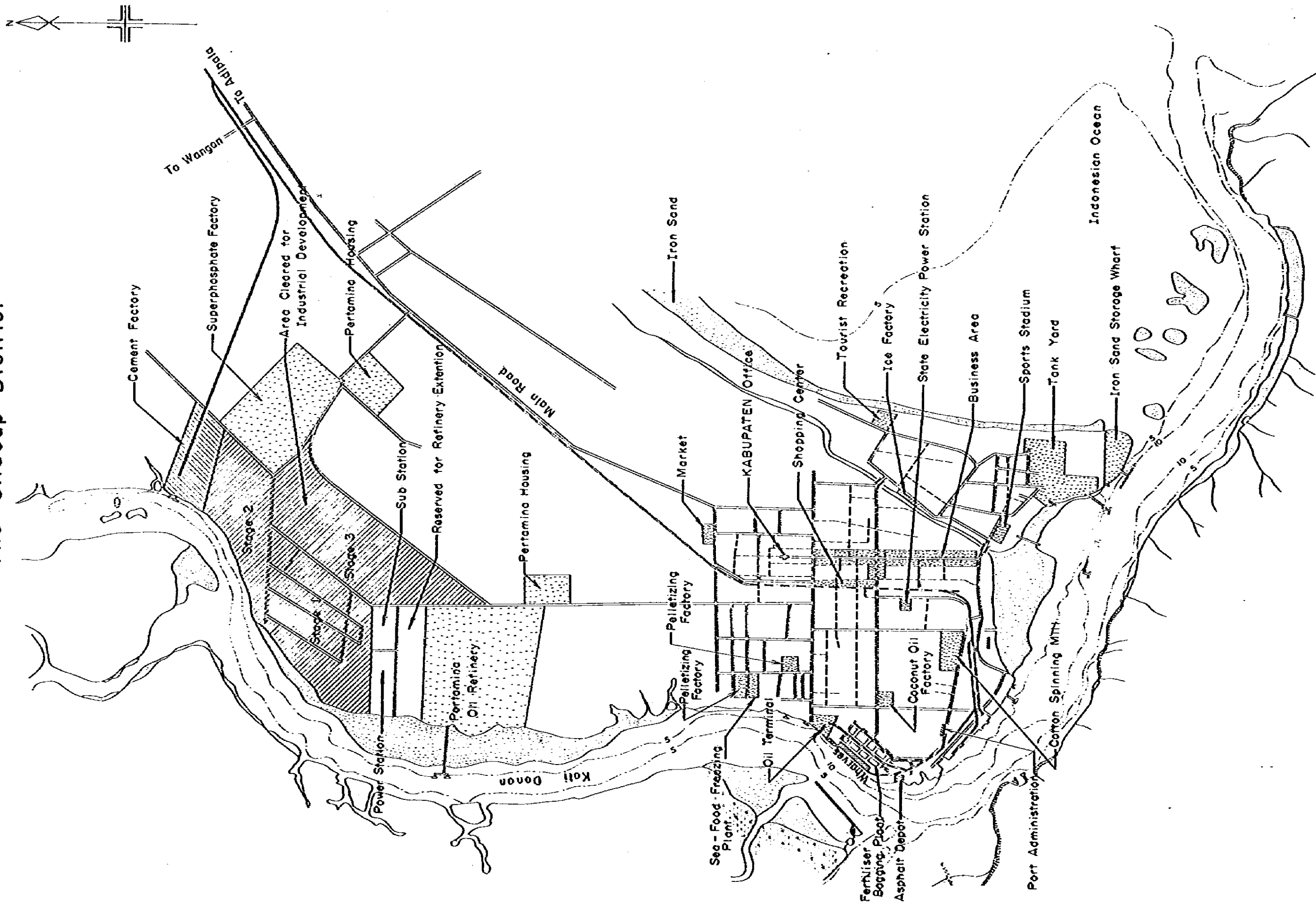


Project Site

The State of Central Jawa



The Cilacap District



CONCLUSION AND RECOMMENDATION

The Cilacap Port is located in Jawa Island and is the only port which faces the Indonesian Sea (Ocean), and the Port's public wharf, in particular, makes the Port as one of the important harbors in Indonesia.

Meanwhile, with the designation of Cilacap Area as the area of preferential development, new establishment of factories, development of factory sites, improvement of roads, etc. are increasingly being encouraged, and also expansion plans of existing factories are being promoted.

In the event that these plans progress ahead as expected, marine transportation in the Area is expected to increase immensely.

However, the cargo handling volume of Cilacap public wharf has already reached the limit, and it is impossible to increase the volume beyond this limit; moreover, no harbor improvement plans to better the cargo handling capacity can be expected at the present stage.

In order to cope with the increase of cargo handling by sea, P. T. Semen Nusantara, with the future expansion of their factory, is planning to newly construct a wharf of which the surplus capacity of cargo handling will be open for public utilization, and this plan would be of great significance from the point of greatly contributing to the improvement of "capacity shortage of the Port's cargo handling", which is hindering the development of Cilacap Area.

It can be gathered that the Governmental Office supervising the Cilacap Area looks upon the Project of P. T. Semen Nusantara with great concern with ardent desire for its early materialization from the following respective statements, in particular, of the Director of Cilacap Harbor Office and the Provincial Governor, as follows:

"The handling capacity of the Port will become impossible within

1 or 2 years to ship out cement by utilizing the Cilacap public wharf, and furthermore, the operation of the public wharf will be placed under grave situation. Accordingly, it is desirable that efforts should be made to materialized the Project of P. T. Semen Nusantara at the earliest date."

and

"Since this Project is essential to the Cilacap Area, every assistance will be given for its materialization."

In view of such existing situation, the Survey Team would recommend early materialization of this Project, and together, in such case, the appropriate scale of respective facilities would be suggested, as follows:

Wharf to be Newly Constructed: Length ... 120 m. Width ... 25 m.
Steel pipe piled wharf.
Water depth in front of wharf ... 10 m.
Construction site to be in the vicinity of P. T. Semen Nusantara Factory.

Waterway : Width ... 100 m. Depth ... 9 m.

Access Road : Width ... 13 m.
(Effective Width ... 8 m.)
Extension ... 650 m.

In the event of the Project's materialization, the access road will be completely open for public utilization, and together, the newly constructed wharf also will be open for such utilization during partial period of time (possessor's rights for utilization to be minimum of 30%).

The total required capital for this Project is, as follows:

(1) Dredging and Wharf Y 1,831,751,000

(2) Access Road	¥ 101,849,000
(3) Basic Costs [(1) + (2)]	¥ 1,933,600,000
(4) Physical Contingency	¥ 193,360,000
(5) Price Contingency	¥ 322,266,000
(6) Total Required Capital	¥ 2,449,226,000
[(3) + (4) + (5)]	(Rp. 7,102,760,000)

Based upon the above figures, the economic evaluation of the Project would be, as follows:

	N P V (Discount Rate = 12%)	B / C Ratio	I R R
(1) Effects to P.T. Semen Nusantara	Rp. -1,212,930,000	0.89	6.89
(2) Effects to the Cilacap Area	Rp. 2,081,660,000	1.21	20.49

Note: NPV : Net Present Value
 B / C : Benefit / Cost
 IRR : Internal Rate of Return

As shown in the above table, if this Project is observed from P. T. Semen Nusantara, the IRR being 6.89, the economic evaluation index is low, and from the viewpoint of commercial and financial basis, the Project can be said to be unfeasible; however, as reported hereinbefore, unless the Port's public wharf is improved, the private wharf of P. T. Semen Nusantara is indispensable with the expansion of their cement factory.

Meanwhile, if this Project is observed from the regional effects of Cilacap Area, the IRR being 20.49, the economic evaluation index is high, and the Project can be said to be extremely promising.

With such difference in viewpoint, the reason for the great difference in economic evaluation index is due to many of the public benefits which

exceed the benefits of P. T. Semen Nusantara, and in this respect, this Project can be said to have high common interests for the public.

Accordingly, this Project is fully capable of promoting the welfare of the Area's surrounding population and of contributing to the Area's economic development; moreover, considering the Project's need for low-interest credit, it is regarded that the Project will answer the purpose of financial loan and investment of the Japan International Cooperation Agency.

Based on an all-round judgment technical-wise and economic-wise, the Survey Team would recommend early materialization of the Project with the employment of Japan International Cooperation Agency's financial loan and investment.

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CHAPTER 1 OUTLINE OF SURVEY

1-1 Objectives of Survey

The survey was conducted to meet the request of Onoda Cement Co., Ltd. and Mitsui & Co., Ltd. of necessary harbor facilities relevant to the expansion of their capital invested company, P. T. Semen Nusantara Cement Factory, which is presently in operation in Cilacap in Jawa Island of the Republic of Indonesia. The objectives of the survey are to conduct investigation and study of the feasibility technically and economically whether improvement of appropriate relevant facilities would contribute to smooth operation of the factory, promote the welfare of the Area's surrounding population and contribute to the development of the Area's economy or not, and make adequate recommendations based on the survey.

1-2 Background of Survey

P. T. Semen Nusantara is a joint enterprise of two Japanese companies, Onoda Cement Co., Ltd. and Mitsui & Co., Ltd., and a local company, P. T. Gunung Nagadeg Djaja, established in the Republic of Indonesia in 1974, with the objective of manufacturing cement by continuous operation (Paid-up capital is Rp. 7,055,000,000 of which Onoda Cement Co., Ltd. and Mitsui & Co., Ltd. share 35% each and P. T. Gunung Nagadeg Djaja shares 30%).

The Company's factory presently operates with 1 kiln (produces 750,000 tons per year); however, in consideration of the sharp increase of cement demand domestically and overseas, the repeated pressing request from the Indonesian Government to make decision for expansion of the factory and the stabilization of production quantity, etc., the factory presently has plans to increase the production up to 2,000,000 tons per

year.

With such increased production, the marine transportation volume of cement will increase to 3 times the present volume; however, the conditions of marine transportation at the present area are not favorable, and particularly, the cargo handling capacity of the Port's public wharf where 10,000 DWT cargo vessel can berth has reached the limit. Furthermore, improvement of the public wharf cannot be expected at the present stage.

In view of such conditions, P. T. Semen Nusantara through their Japanese shareholders, Onoda Cement Co., Ltd. and Mitsui & Co., Ltd., has requested the Japan International Cooperation Agency for survey in regards to the new construction of wharf and its relevant infrastructure plan.

1-3 Contents of Survey

Surveys conducted at the site are, as follows:

A. Natural Conditions Surveys

1. Bedrock Survey

- a. Boring at sea 3 spots
- b. Survey of waterway bottom sediments

2. Surrounding Water Area Survey

- a. Checking of existing depth sounding chart
- b. Survey of tide level and tidal current

3. Surrounding Regional Survey

Survey of proposed site for access road.

B. Surveys of Socioeconomic Conditions

1. Economic Survey (Collection of analysis data concerning economic trends)
2. Commodity Flow Survey
3. Survey of Development Plans

- 4. Utility Survey
- C. Survey of Projected Factory
- D. Surveys of Construction Works
 - 1. Survey concerning regulations of construction works
 - 2. Essential market survey for cost estimation of construction works.

1-4 Organization of Survey Team and Duties of Respective Members

Names of members of the Survey Team despatched to the survey site and their duties are, as follows:

Table 1-1 Members of Survey Team

Name	Duty	Status
Hiromichi KONO	Leader (Gen. Manager/Harbor	Mitsui Consultants Co.
Atsushi KURIWADA	Access Road/Soil Survey	Onoda Engineering Co.
Shoichi KOBAYASHI	Development Effect Analysis	"
Atsushi KUMAGAMI	Harbor Facilities Survey	Mitsui Consultants Co.
Takao SAITO	"	"
Tsutomu KURIHARA	"	"
Takao KOMATSU	Economic Analysis	Ministry of International Trade & Industry

CHAPTER 2 PRESENT SITUATION OF KABUPATEN
(PREFECTURE) CILACAP

2-1 Administrative District

Kabupaten Cilacap is located in the south-western area of Central Java and it faces to the Indonesian Ocean. The area of Kabupaten Cilacap is 2,344 km². The Kabupaten Cilacap consists of 17 Kecamatan (districts) and the districts consists of small Desa (villages).

The Cilacap district, where the prefectural office is located, is divided into following 3 areas from geography.

(1) Cilacap Peninsula

The peninsula faces to the Indonesian Ocean at east and to the Donan river at south and west. The prefectural office, the port, the bus-terminal, the railway stations, and main factories are concentrated in this area as a center of the Cilacap district.

(2) Nusakambangan Island

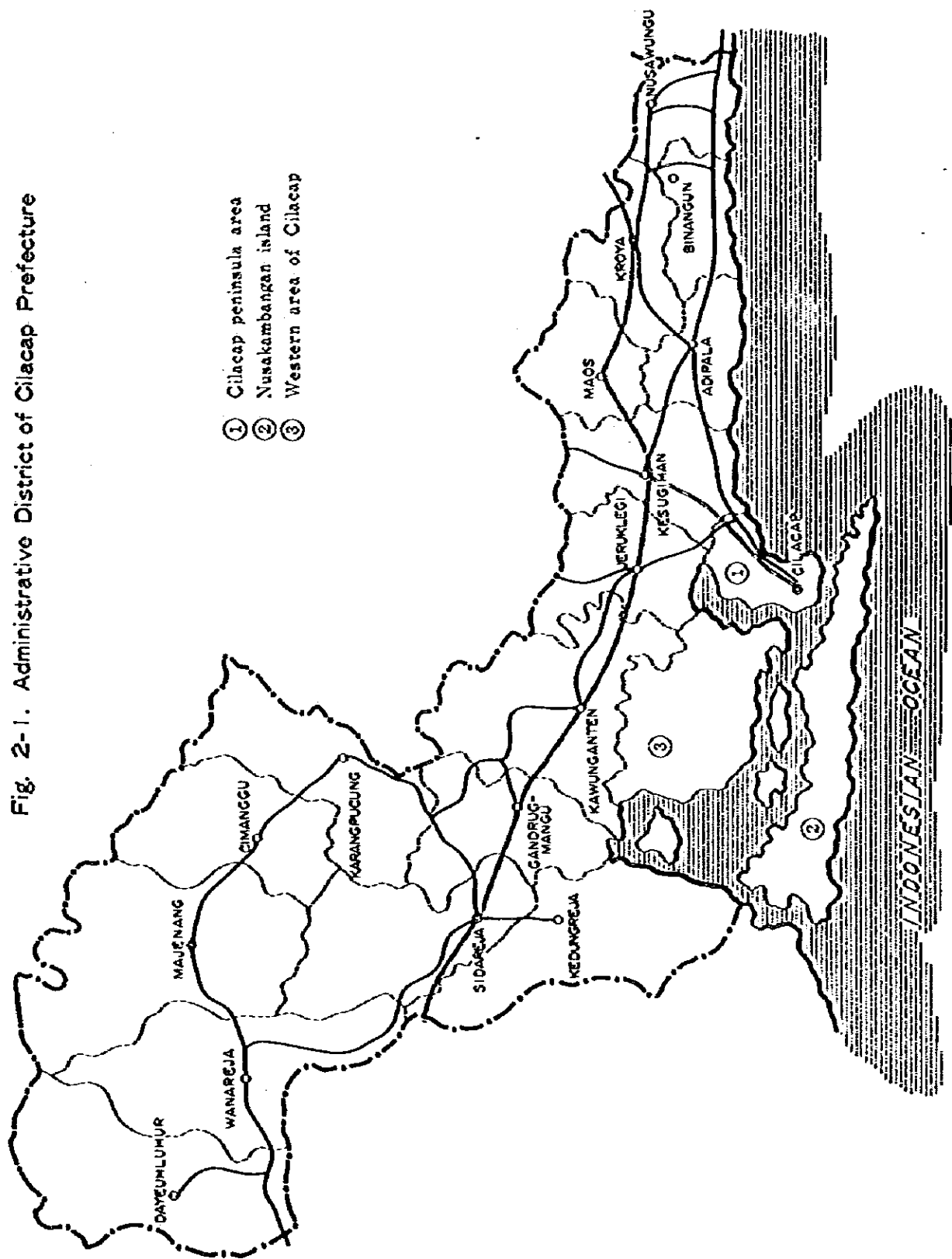
This island is located in the south of Cilacap peninsula and is 30 km toward east and west, and 4 km toward south and north.

This island is used as a prison area.

(3) Western Area

Western area of the Cilacap district forms swampy land. In the southern part of the area, swamp is prevailing and the northern part is agricultural area.

Fig. 2-1. Administrative District of Cilacap Prefecture



2-2 Population

The population of the Cilacap district in 1979 is estimated at 1,311,194 and density of population is 558/km². The density of the population is lower than that of the overall Java island that is 688/km².

The growing ratio of the population in the Cilacap district is 1.2 - 1.3% annually and it is lower than 2% in the whole country.

The population of the Cilacap district has increased during the later half of 1970s with an annual growing rate of 3.5% and it reached to 153,848 in 1979.

Also in future, a relatively high increase is expected, since expansion in industrial sector such as PERTAMINA refinery, the cement factory and other firms is foreseen. When the population increases with a growing ratio of 3.5% annually, it will reach to about 210,000 in 1990.

Table 2-1 Trend of Population

	1974	1975	1976	1977	1978	1979	Growth rate (74-79)
R.I.	126,210,000 2.00%	128,730,000 2.00%	131,300,000 2.01%	133,940,000 2.01%	136,630,000 2.00%	139,360,000	(74-79) 2%
Cilacap Pref.	1,225,400 0.98%	1,237,300 2.72%	1,271,000 1.20%	1,286,200 1.23%	1,302,100 1.30%	1,311,194 0.70%	1.3%
Cilacap Dist.	128,591 2.32%	131,568 2.21%	134,476 7.59%	144,681 4.65%	150,552 3.50%	153,848	3.5%

2-3 Industry and Income

Economy of Cilacap district relies mainly on agriculture, and the share of agriculture in 1978 is 63.8% in the gross production. The figure is about twice of those of the whole country (34.1%) and central Java (36.8%).

In working population, agriculture shares 73.3% and it shows characteristics of the economy of Cilacap district.

As mineral resources, only limestone and a small quantity of iron sand are mined in the area and the production share of mining is 1.07% that is very low comparing to 11.1% in the whole country.

The industrial sector has grown during the later half of 1970s and has effected the regional economy, since some modernized factories were established due to the port which is an only port along the south coast of Java. Industry shares 14.4% of the regional production in 1978; it is higher than 12.3% for national average. However, as the newly established factories are modernized ones and performing high productivity, their contribution in increasing of employment is not so high (approx. 3.3%).

The low productivity owing to the small landhold is one of the reasons of the low income per capita in the Cilacap prefecture. Income per capita of the Cilacap prefecture is about Rp 50,000 annually, and it is 31.5% of the average income of the country and 50.2% of the average income of Central Java.

(refer to Fig. 2-2)

However the income per capita of the Cilacap prefecture is growing by 9.7% (net) annually, and it is approaching to the national level. The income per capita of the Cilacap prefecture was 25.6% of the national average and 31.5% in 1978.

Table 2-2 Production and Share in Cilacap Pref. (at market price) (Unit: Rp. 1,000)

No.	Sector	1975		1976		1977		1978	
		Production	Share (%)	Production	Share (%)	Production	Share (%)	Production	Share (%)
1	Agriculture	16,680	(53.90)	27,362	(64.61)	38,703	(63.84)	41,594	(63.80)
2	Mining	615	(1.99)	815	(1.92)	1,014	(1.67)	695	(1.07)
3	Manufacturing	5,008	(16.19)	4,850	(11.45)	9,200	(15.17)	9,395	(14.41)
4	Elec./Gas/Water	967	(3.13)	890	(2.10)	991	(1.63)	1,061	(1.63)
5	Construction	11	(0.04)	13	(0.03)	28	(0.05)	37	(0.06)
6	Trading	1,962	(6.34)	2,185	(5.16)	2,199	(3.63)	2,443	(3.75)
7	Transportation/ communication	815	(2.63)	876	(2.07)	923	(1.52)	945	(1.45)
8	Financing/ Banking	809	(2.61)	863	(2.14)	1,012	(1.67)	1,250	(1.92)
9	Realty services	1,224	(3.95)	1,467	(3.35)	1,793	(2.96)	2,256	(3.46)
10	Governmental services	2,533	(8.19)	2,696	(6.37)	4,190	(6.91)	4,875	(7.48)
11	Other services	323	(1.04)	382	(0.90)	576	(0.95)	638	(0.98)
Total		30,947	(100)	42,348	(100)	60,630	(100)	65,191	(100)

Table 2-3 Employment in Cilacap Prefecture 1978 (Dec. 1987)

No.	Industry	Employment	Share (%)
1	Agriculture	618,877	73.36%
2	Manufacturing	26,880	3.30
3	Construction	18,649	2.27
4	Trading	45,556	5.53
5	Transportation	10,525	1.28
6	Government	16,681	2.03
7	Others	112,644	13.67
Total		823,347	100%

Fig. 2-2 Trend of Income per capita

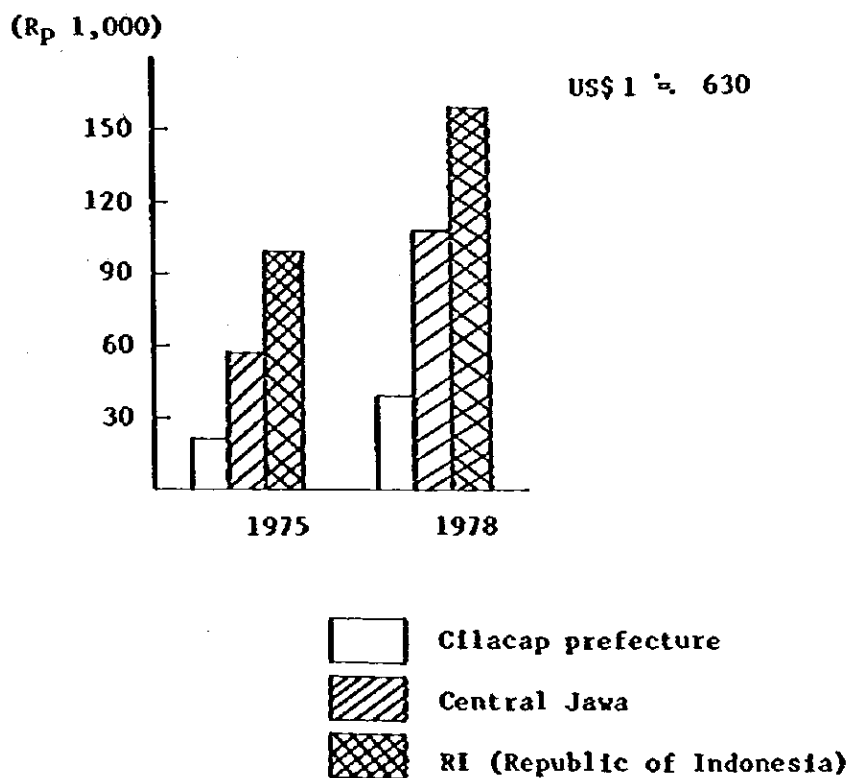


Table 2-4 Production Share by Sector (1978)
(Unit: %)

Sector	Cilacap Pref.	Central Java	R.I.
Agriculture	63.8	36.76	34.1
Mining	1.07	0.44	11.1
Manufacturing	14.41	12.79	12.3
Others	20.72	50.01	42.5

Table 2-5 Employment Share by Sector (1978)
(Unit: %)

Sector	Cilacap Pref.	Central Java	R.I.
Agriculture	73	62.8	60.0
Manufacturing	3.3	10.1	-
Others	23.7	27.1	-

Table 2-6 Gross Production per Capita (Unit: Rp.)

Year	Cilacap Pref.	Central Java	R.I.
1978	50,246	109,824	159,464
1977	47,307	87,392	139,660
1976	33,803	71,539	117,799
1975	25,108	57,157	98,213

2-4 Agriculture, Forestry and Fishery

Agriculture and forestry share 91.5% in production and fishery shares 8.2%.

Forestry is negligibly small (0.3%).

Table 2-7 Production Share in Agriculture

		Production (Rp.)	Share (%)
Agriculture	Crops	22,840,891	(54.9 %)
	Non-Crop food	7,276,068	(17.5 %)
	Estate Crop	1,431,186	(3.4 %)
	Cattle	6,530,222	(15.7 %)
Forestry		118,966	(0.3 %)
Fishery		3,396,412	(8.2 %)
Total		41,593,745	(100.0 %)

2-4-1 Agriculture

In the agriculture sector, the share of crops, non-crop and livestock are 60%, 19.1% and 17.1% respectively.

Important crops are rice (66%), cassava (22%) peanuts (3%), maize (2%) and soya beans (2%), and these 5 articles share 98%.

(refer to Table 2-10)

Important articles in livestock are goat, sheep, and chicken, then buffalo and cow follow.

Almost agricultural products are consumed in the Cilacap prefecture,

but only cassava is exported mainly to the European countries after processing in the two factories located near the public port.

Rice produced in the Cilacap prefecture is insufficient for its own consumption, so about 100,000 tons of rice is annually imported through the Cilacap port for the Cilacap and the adjacent prefectures.

2-4-2 Fishery

The Cilacap prefecture is blessed with the fishing places such as the Indonesian Ocean, the Donan river and the swamps.

The fishery shares 5% of the gross production of the prefecture and it is higher than that of the country (1.6%).

According to the statistics of the prefectural government, in 1978, 9,839 persons are engaged in the fishery and the annual production is 3 tons. The products are consumed in the region, but only shrimp gathered in the whole Central Java is exported to Japan after freezing in Cilacap.

2-5 Industry

Industry in Cilacap has grown during 1970s to share 14.4% of the production of the industry in Central Java in 1978.

Employment of the industry sector remains at 24,000 in 1978 (3% of employment), but it has increased by a growing ratio of 14.3% (2,000 - 3,000 persons) annually during recent years (1975 - 1978).

As of 1978, there are about 8,500 firms in the Cilacap prefecture, and 99.5% of the firms are small ones with an employment of and less than 20 firms. Middle scale firms with workers of 20 - 99 are 34 firms and big scale firms with workers of and more than 100 are 6 firms.

Table 2-8 Production and Planting Area by Food Crops

	1975		1976		1977		1978			
	ha	ton	ha	ton	ha	ton	ha	Share (%)	ton	Share (%)
Rice	109,101	237,537	102,578	228,491	80,363	300,572	139,540	(83.0)	302,127	(50.7)
Maize	2,556	2,136	5,517	2,130	7,586	2,130	3,361	(2.0)	5,828	(1.0)
Cassava	13,892	92,940	13,433	152,155	17,590	203,945	17,490	(10.4)	231,942	(38.9)
Sweet-potato	1,411	7,712	1,355	5,956	1,421	7,018	965	(0.6)	49,690	(8.3)
Peanuts	2,090	1,458	2,694	1,317	3,556	2,073	2,763	(1.6)	2,928	(0.5)
Soyabeans	3,028	1,329	3,736	1,359	4,598	3,495	3,179	(1.9)	2,943	(0.5)
Greenpeas	628	285	738	205	1,064	324	712	(0.4)	606	(0.1)
Sorghum	123	147	130	980	293	254	75	(0.0)	324	(0.05)

168,085 ha (100%) 596,388 ton (100%)

Source: KABUPATEN DAERAH, TINGKAT II, Cilacap

Table 2-9 Production of Food Crop in Cilacap Prefecture

(Unit: Rp 1,000)

Item	1975	1976	1977	1978	(Share)
Rice	12,040,751	15,148,953	23,564,845	22,659,525	66.30
Cassava	2,323,500	4,184,263	6,118,350	7,538,115	22.05
Peanuts	349,920	332,543	673,725	1,171,200	3.42
Soya beans	167,375	243,428	629,100	580,860	1.69
Maize	138,840	170,400	332,000	524,520	1.53
Sweet potato	231,360	208,460	280,720	173,915	0.50
Shorghan	77,175	7,350	20,320	25,920	0.07
Greenpeas	49,875	39,975	76,820	18,180	0.05
Others	744,497	931,669	1,075,786	1,480,609	4.33
Total	16,123,293	21,267,041	32,771,696	34,172,844	100%

Source: KABUPATEN DAERAH TINGKAT II Cilacap

Table 2-10 Production of Non-food Crops in Cilacap Prefecture

(Unit: Rp 1,000)

	1975	1976	1977	1978	(Share)
Coconuts	3,072,309	4,150,707	3,074,862	4,317,178	52.2
Fruits	672,750	1,606,392	1,543,596	2,540,252	30.7
Spice	304,506	303,465	812,973	1,000,109	12.1
Coffee	133,509	162,455	303,000	335,500	4.1
Latex	48,253	56,121	54,253	77,175	0.9
Cotton	237,424	333,072	243,678	1,978	(0.02)
Others					
Total	4,468,751	6,612,212	6,032,362	8,272,909	≈100%

In production, the chemical industry shares 91% and three main industries, namely chemical industry, food processing industry, and textile industry, shares 99%.

This shows for that the share of the oil refinery and the cement plant is big.

As for employment, the textile industry shares 41.8% and the three important industry, namely food processing, steel work chemical and construction material industries shares 80%. And the higher ranked 5 industries shares 96.5%.

The main firms in the Cilacap prefecture, namely oil refinery, a textile factory, a cement factory, a fertilizer pelletizing factory, and two cattle food factories, shares 25% (approx. 6,000 persons) of the whole industrial employment of the Cilacap prefecture.

Table 2-11 Production by Industries in Cilacap Prefecture

(Unit: Rp)

Industries	1975/76	1976/77	1977/78	1978/79
Food industry	7,335,167	4,244,952	6,157,996	5,423,433
Drink industry	100,282	156,199	286,817	179,507
Tobacco industry	-	-	-	-
Textile industry	5,846,930	4,419,378	4,813,544	3,316,215
Steel work industry	27,778	38,622	30,745	25,906
Medicine industry	256,392	22,665,310	89,885,035	88,304,441
Mineral industry	124,549	153,126	214,880	204,011
Mechanical industry	4,860	7,915	8,064	8,045
Hand kraft	39,180	30,071	42,986	39,517
Others	67,845	16,331	14,065	13,517
Total	13,002,982	32,281,616	100,520,280	96,906,400
Production Cost	7,994,844	28,229,944	93,790,000	90,656,437
Value Added	5,008,139	4,051,662	6,730,274	6,247,970

Table 2-12 Employment of Industry in Cilacap Prefecture

(Unit: person)

	Industries	1975	1976	1977	1978
1	Food industry	5,436	7,461	5,776	5,306
2	Drink industry	13	2	11	39
3	Tobacco industry	-	-	-	-
4	Textile industry	7,058	7,596	10,052	10,230
5	Steel work industry	641	1,937	3,031	4,062
6	Medicine industry	919	1,302	2,211	2,521
7	Mineral industry	1,691	584	1,381	1,499
8	Mechanical industry	350	300	338	358
9	Hand kraft	60	77	76	105
10	Others				
11					
	Total	16,391	18,626	21,243	24,492

Table 2-13 Major Firms in Cilacap

Name of Firm	Classification	Employment
1. P.D. PATAL TJILATJAP	Textile	2,642
2. P.N. PERTAMINA	Oil refinery	1,200
3. P.N. T. SEMEN NUSANTARA	Cement	1,000
4. P.N. PSURI	Fertilizer packing	400
5. P.T. TJILATJAP PELLETIZING FACTORY	Pelletizing	369
6. P.T. DONAN PELLETIZING FACTORY	"	660
7. P.D. ESSARIPETOJO	Ice freezing	47
8. P.T. SUMBER ASREP	Foods	26
9. C.V. SINDANG RATU	"	20
10. C.V. GUNUNG SARI	"	35
11. C.V. CIGUHA	"	21
12. KUEN NING	"	37
13. C.V. BUDI ANGKASA	"	39
14. C.V. CILONING	"	42
15. MARGASARI	"	16
16. DIBYA KARYA	"	54
17. BERKAH I TONGLIE	"	21
18. KWA OMAS	"	20
19. PA PANEN	"	16
20. LUKMAN	"	12
21. HARGO MULIA	"	15
22. BANTAR JAYA	"	16
23. KAPAL UDARA	"	32
24. HTRU SUTRISNO	Brick	15
25. SIWAN ATHOSAPUTRO	"	26
26. INDAH JAYA	"	35

2-6 Mining

Production share of mining in Cilacap is only 1.1%. The composition and the share are shown in Table 2-14.

Table 2-14 Production of Mining Industry (1978)

Item	Production (Rp)	Share (%)
Ironsand	661,251,000	95%
Sand and stone	26,571,000	3.8%
Limestone	7,491,000	1.2%
Total	695,313,000	100%

CHAPTER 3 PRESENT SITUATION AND FUTURE PROSPECT OF P. T. SEMEN NUSANTARA

3-1 Present Situation of Cement Factory in Cilacap

P. T. Semen Nusantara was established as an Indonesian company in 1974 objecting production and sale of portland cement. Paid-up capital is 7,055 million rupiah and share holders are P. T. Gunung Ngadek Jaya from Indonesia, Mitsui & Co., Ltd., and Onoda Cement Co., Ltd. from Japan. Their share are 30%, 35%, and 35% respectively.

The construction of the cement factory in Cilacap was started in March 1975 and completed in May 1977, then commercial operation was commenced successfully.

Present situation of the cement factory in Cilacap is as follows:

Location of plant: Karangtalum, Cilacap, Central Java

Employee: Regular employee 529 (Japanese 13)

Contract 677

Capacity of factory: 600,000 T/annum

Area of relevant site: Cement factory 26.5 Ha

Packing plant 3.5 Ha

Limestone quarry 50.0 Ha

Clay quarry 20.5 Ha

Housing area 10.0 Ha

Material supply:

Material	Location of Source	Transportation
Limestone	Nusakambangan	Sea Transportation by barges, 11 km
Clay	Suburb of Cilacap	Truck transportation 4 km
Silica sand	Jatilogo	Railway transportation, 500 km
Iron sand	Cilacap	Truck transportation 10 km
Gypsum	Japan & Australia	Sea and truck transportation, 7 km from Cilacap port
Craft paper	European countries	Sea and truck transportation, 7 km from Cilacap port
Past production:	1977	265,000 t
	1978	595,000 t
	1979	683,000 t
	1980	700,000 t (expected)

Outline of Production Facility

Process	Specification	Q'ty	Capacity
1. Limestone quarry			
Quarrying equipment	Bulldozer Crawler drill		
Crusher	Hasemag A-P-6C 930 HP x 2 motors	1	500 t/hr
Transportation	Dump truck 18 t		
Sea transportation	Barge Tag boat	2 1	1,100 t
Unloading crane	4.5 t cap	1	300 t/hr
Extractor	PHB-VP2-150/32	1	
Limestone yard		2	10,000 t
Clay crusher	Roll crusher 1,000 D x 1,000 W	2	100 t/hr
Clay yard			380 t
Clay dryer	3,950 D x 28,000 L	1	30 t/h
and electric dust collector	4,150 m	1	EP 2,300 m/min
2. Raw meal preparation			
Raw mill	MPS roller mill	1	150 t/h
E.P fan	HP 4,000/3,800 Bbr	1	EP 3,750 m/min
Dust collector	1,740 HP, 5,700 m	1	EP 3,750 m/min
Raw meal silo	for blending	1	2,000 t
"	for storage	1	3,500 t
3. Burning			
S.P tower	No. 4 cyclone 2 x 4,750 D	1	
"	No. 1, 2, 3 cyclone	3	
S.P. fan	HP 1,630/4,500 Bbr		
Stabilizer	MP 240		

Process	Specification	Q'ty	Capacity
4. Clinker grinding			
Gypsum yard	Indoor	1	200 t
"	Outdoor	1	5,000 t
Clinker silo		2	5,000 t x 2
Cement mill	SONEX-UNDIAN mill 44,000 x 12,500 L 4,000 HP	1	90 t/h
Separator	CVFC 5,600 O.D	1	180 HP
Dust collector	703 m	1	310 m/min
Cement silo	Plant silo	2	4,000 t x 2
"	Private jetty	1	4,000 t x 1
Packing machine	Plant RU-12	3	80-100 t/h
"	Private jetty RU-12	3	"
5. Auxiliary facility			
Diesel generator	Plant: 6,000 V 3 phase	4	5,400 kW x 4
"	"	1	600 kW x 1
"	Limestone quarry: 6,000 V, 3 phase	3	1,000 kW x 3
"	Packing plant: 380 V, 3 phase	3	200 kW x 3
Fuel oil tank	for fuel	1	5,000 kℓ
Diesel oil tank	for generator	1	2,500 kℓ
Machine tool	for repairshop		
Paper sack machine			5,000 sack/hr
Tag boat	750 HP	2	
Wagon and locomotive	30 t wagon	12	
Locomotive	335 HP	1	

3-2 Position of P. T. Semen Nusantara

The cement factory in Cilacap is only one cement factory in Central Java as known from the location map of cement factories of Indonesia. So the factory has contributed to the development of east area of West Java and west area of East Java as well as Central Java. And cement delivery to outside Java has been active due to the convenient location of the factory for sea transportation.

Although some plans for establishments of cement factories in Central Java are reported, the economical feasibility and realization of the projects are doubtful. Hence, it is conceived that the position of P. T. Semen Nusantara will continuously be important for the development of Java.

3-3 Expansion Program of Cilacap Cement Factory

3-3-1 Necessity of the expansion

In order to maintain stable supply, cement factory is usually provided with plural production lines.

P. T. Semen Nusantara also intended to have 3 production lines in planning stage and prepared land for them.

However, it has only one production line up to now, so there is fair that serious problems such as shortage of cement and price disorder caused by production stoppage of plant trouble will occur.

And such disorders may be socially impeached. In addition to that, loss in sales profit and market share may be critical problems for P. T. Semen Nusantara.

On the other hand, P. T. Semen Nusantara has been required by the authority to expand the production capacity and it is said that another cement factory must be approved to be set up in Central Java because it is required by the Central Java authority.

Under such circumstances, P. T. Semen Nusantara has submitted an application for the expansion of 7,000,000 t/year capacity to BKPM.

3-3-2 Schedule of Expansion

The expansion schedule of P. T. Semen Nusantara is as follows:

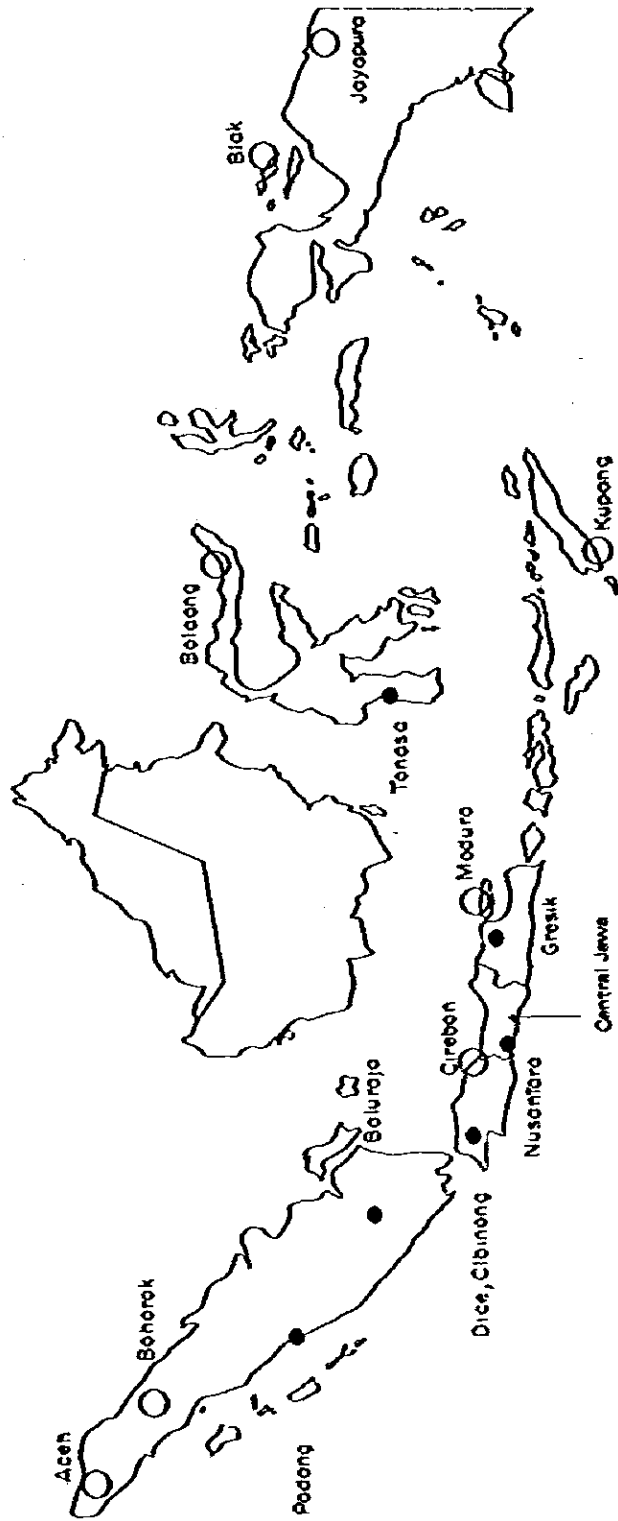
1981	150,000 t/year:	by partial modification
1983	600,000 t/year:	by installation of No. 2 kiln
1985	350,000 t/year:	by modification of No. 2 kiln
1987	350,000 t/year:	by modification of No. 1 kiln

3-4 Present Situation and Future Prospect of Cement Industry in Indonesia

3-4-1 Demand

As a background of the expansion program of P. T. Semen Nusantara, present situation and future prospect of the cement industry in Indonesia are herein studied. Cement Industry is one of the key industry in Indonesia and the government strongly controls the activities of cement manufacturers. New establishment and expansion of cement plant is an approving matter of the government and the government has initiative in promotion of cement industry. As to cement demand in Indonesia, some forecasts have been published as shown, hereinafter in Table 3-1, 3-2, and 3-3.

CEMENT PLANT LOCATION



○ Projected Cement Plant

● Existing Cement Plant

Table 3-1 Demand Forecast by ASI
(Unit: 1,000 t)

Case \ Year	Year			
	1980	1981	1982	1983
A	4,698	5,195	5,620	6,240
B	4,875	5,660	6,495	7,370
C	5,028	5,080	7,540	8,520
D	5,273	6,581	8,045	10,000

On the above forecast, average annual growth ratios are:

Case-A	9.9%
Case-B	14.8%
Case-C	18.2%
Case-D	23.8%

Table 3-2 Demand Forecast by Canadian International Cooperation Agency
(Unit: 1,000 t)

Case \ Year	Year				
	1980	1981	1982	1983	1984
A	6,200	7,400	8,800	10,400	11,800
B	5,500	6,400	7,300	8,400	9,600
C	4,400	4,900	5,500	6,300	7,200

In the above forecast, average annual growth ratios are:

Case-A	17.5%
Case-B	14.9%
Case-C	13.1%

Table 3-3 Demand Forecast by P. T. Semen Nusantara
(Unit: 1,000 t)

1980	1981	1982	1983	1984	1985	1986	1987	1988
5,134	5,775	6,501	7,323	8,248	9,288	10,463	11,966	13,257

Average annual growth ratio in above forecast for 5 years of 1980 - 1984 is 12.6%.

According to a demand forecast by the Ministry of Industry of Indonesia, the demand in 1984 that is the last year of the PELITA-III, is 11,000,000 - 12,000,000 tons. The growth ratio in the above demand forecast is 17.5 - 20% annually. This figure may be reasonable so far any heavy fluctuation in national economy is not expected, and the growth ratio estimated by P. T. Semen Nusantara is lower than the figure of the government. So the demand forecast by P. T. Semen Nusantara is in safety zone and it may be reasonable as a basis of its expansion program.

The demand forecasts are presented in Fig. 3-2.

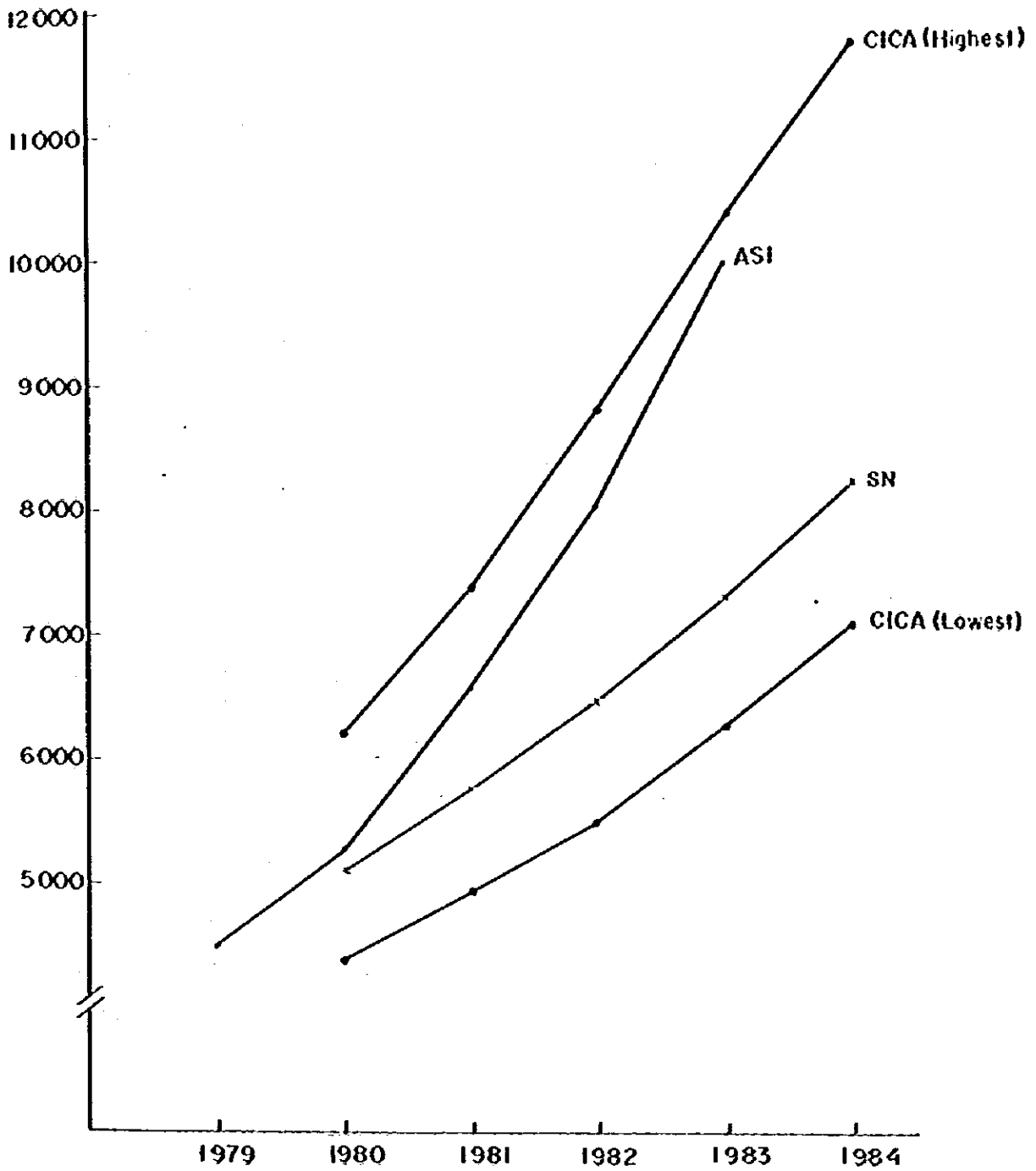
3-4-2 Cement Production

A total production capacity of 1980 in Indonesia is estimated to be approx. 5 million tons and, on the other hand, some expansion or new establishment plans are reported.

The proposed schedule is as follows:

P. T. Semen Padang	1984	600,000 T/annum
P. T. Semen Gresik	1988	500,000 "
P. T. Semen Tonasa	1985	500,000 "

Fig 3-2 Various Demand Forecast



(Unit : 1,000 T/year)

P. T. Semen Cibinong	1983	800,000 T/annua	
	1986	800,000	"
DICE	1981	1,000,000	"
	1985	1,500,000	"
P. T. Semen Batraja	1980	500,000	"
P. T. Semen Ache	1984	600,000	"

3-4-3 Demand and Supply Balance

In accordance with the foresaid demand and supply forecast, the balance is shown in Table 3-4 and Fig. 3-3.

Table 3-4 Demand Supply Balance
(Unit: 1,000 t)

	1980	1981	1982	1983	1984	1985	1986	1987	1980
Production	6,098	7,180	7,205	8,005	9,155	11,210	11,710	12,330	12,730
Demand	5,134	5,775	6,501	7,323	8,247	9,288	10,463	11,966	13,257
Balance	+964	+1,405	+704	+682	+908	+1,922	+1,247	+364	Δ527

(by estimation of P. T. Semen Nusantara)

As known from the above table, it is presumed that the production exceeds the demand by the year of around 1986, and the balance will be exported. After 1988 production will fall below the demand and the export will be impossible. And cement import will be required again unless any other expansion of production is realized.

3-5 Market of P. T. Semen Nusantara

Main markets of P. T. Semen Nusantara are eastern area of West Java, Central Java and western area of East Java.

However, the areas out of Java island are also important markets for the company and a half of the products is shipped to those areas. It should be reminded that the location of the cement plant in Cilacap is advantageous for shipping and it will play an important role for development of outer islands.

3-6 Present Situation and Prospect of Cement Transportation

3-6-1 Present Situation

Bagged cement of P. T. Semen Nusantara is delivered by trucks and railway in Java. Ratio of truck transportation to railway was 3: 2 in 1979.

Present capacity by transportation means is:

Truck	:	800 T/day
Railway	:	600 T/day
Ship	:	600 T/day

As to truck transportation, load is limited to 4 tons, because of the inferior road condition in the area.

On the other hand, as improvement of railway transportation cannot be expected for near future because of shortage of locomotive and wagon, the transportation is obliged to depend on the truck transportation.

As for sea transportation, cement is loaded at the private berth in Wijayapula and at the public berth.

At the private berth, capacity of vessels is limited up to 4,000 D.W.T. and difficulty of chartering vessels with such scale is one of the critical problems in the sea transportation.

Crowd of the public port due to the sharp increase of cargo causes frequent demurrage and it is impossible for cement shipping to rely on the public port.

Shipping in the public port must comport with regulated priority, therefore the cement shipping is often stopped when prior material is in port.

Under this condition, it is unreliable and risky to rely on the shipping in the public port.

For P. T. Semen Nusantara, sea transportation is very important as it has wide market outside Java. Furthermore, the company has a plan of bulk transportation in a form of clinker and bulk cement for a rationalization of the transportation.

Sea transportation by big scale vessel is important for P. T. Semen Nusantara, so the establishment of the proposed berth is essential from the present situation of berthes in Cilacap.

3-6-2 Transportation Program

P. T. Semen Nusantara has a program for improvement of transportation conditions in accordance with the expansion program of the cement plant.

(1) Inland transportation

1980 - 1982

Truck: Increasing capacity of approx. 100 T/D in 1982 to make it 903 T/D

Railway: 600 T/D as present

1983

Truck: Increasing capacity to 1,417 T/D
(70% of inland transportation)

Railway: 600 T/D as present

1984 - 1988

Truck: 1,556 T/D - 2,694 T/D

Railway: 1,039 T/D - 1,794 T/D

(2) Sea Transportation

1980 - 1982

Private Berth

200,000 t/year as present

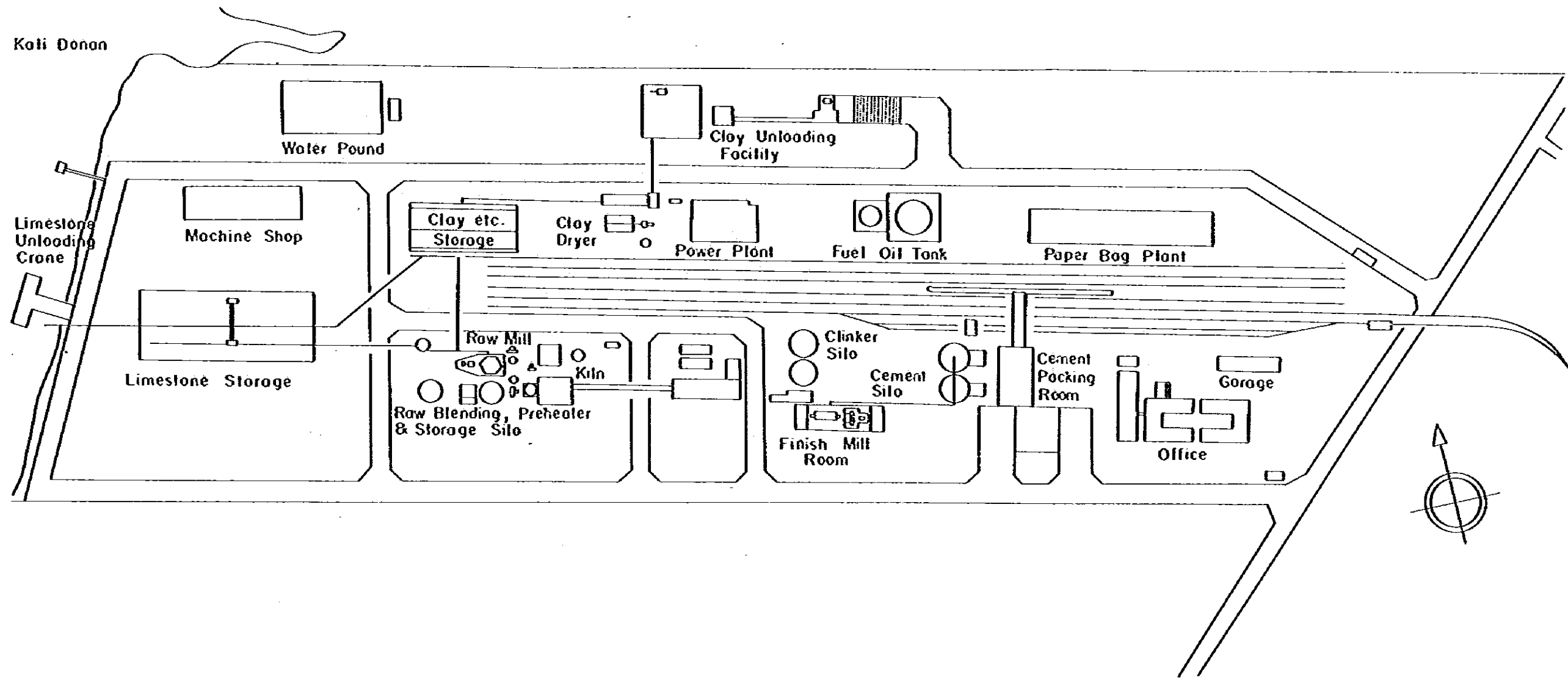
Public Berth

1983 -

Existing private berth 200,000 t/year

New private berth 410,000 t/year

LAYOUT OF CEMENT PLANT PT SEMEN NUSANTARA



CHAPTER 4 CONDITIONS OF PORT

4-1 Natural Conditions

4-1-1 Topography

The proposed jetty construction area exists in Kali Donan. "Kali" means river in Indonesia. But, Kali Donan is an estuary which is shaped on the coastal plain between the South Seraju range and Nusa Kambangan. Therefore, sea water goes up and down in it corresponding with the tide. The town of Cilacap is situated on the east bank of Kali Donan.

The latest sounding survey of Kali Donan was carried out in December, 1979 by Pt. Semen Nusantara. Judging from these data which were found to be exact, the channel between the mouth of Kali Donan and the jetty of Pertamina oil refinery has been dredged 6 meters (below C.D.L.) in depth and 60 meters in width, and the channel between the jetty of Pertamina oil refinery and the jetty of Pt. Semen Nusantara is in natural condition - irregular depth and width.

4-1-2 Soil Conditions

Soil conditions near the proposed jetty construction area are predominantly consisted of silty clay. The layer of 22 to 24 meters below C.D.L. was found to have enough bearing value - greater than 50 in N-value (by standard penetration tests) - for bearing piles.

Siltation in the channel between the mouth of Kali Donan and the proposed jetty construction area is estimated at 0.07 m/year on the average.

4-1-3 Meteorology

Tropical cyclones ... Tropical cyclones occur in the seas south of

Java and Nusa Tenggara, and are also liable to occur somewhat to the north of the latter. But, they are not frequent and rarely come to Cilacap - less than once a year.

Wind ... In Cilacap, a trade-wind climate obtains, with south-easterly winds predominating throughout the year. Except for local and temporary squalls, strong winds are rare. Monthly mean wind velocity is less than 5 m/s, daily mean is almost less than 10 m/s, and maximum is about 20 m/s.

Rainfall ... Annual precipitation is 3,000 to 4,000 mm. On the northern coast of Java, the difference between the wet season and the dry is marked. However, Cilacap have considerable rainfall in the dry season - in the south-east monsoon. Most of the rain falls in the form of localized heavy showers, lasting for relatively short periods. Often these develop into thunderstorms.

Fog ... Fog is rare and visibility is generally good. Most of the occasions of reduced visibility are due to rain. This comparatively frequently reduces visibility to about two to four miles, but the reduction is usually short-lived.

4-1-4 Oceanography

Tides ... Near the proposed jetty construction area, the tides were observed to be similar to that at the public harbour - situated at the mouth of Kali Donan - except for the time lag of 30 to 60 minutes.

Components

Harmonic Constants		M ₂	S ₂	K ₁	O ₁
Amplitude	(cm)	50	25	19	12
Epoch	(degree)	125	57	85	103

([Tide Tables (1980)] Markas Besar Ini-Angkatan Laut
Jawatan Hidro-Oceanografi)

Highest High Water Level (H.H.W.L)	2.16 m
Mean High Water Level of Spring Tide (H.W.O.S.T.) High Water Level (H.W.L.)	1.85
Mean Sea Level (M.S.L.)	1.10
Mean Low Water Level of Spring Tide (L.W.O.S.T.) Low Water Level (L.W.L.)	0.35
Chart Datum Level (C.D.L.)	0

Tidal Currents ... Tidal currents in Kali Donan were observed to be almost entirely semi-diurnal and to change the directions corresponding with tides. At spring tides, the maximum velocity was observed to be about 1.0 m/s in the upper layer, and about 0.7 m/s in the lower layer. At neap tides, the maximum velocity was observed to be about 0.5 m/s in the upper layer, and about 0.35 m/s in the lower layer.

As a rule, the current velocity is a little greater in the upper layer than in the lower layer, and the out-going current - ebb tide - is faster than the in-going current - flood tide.

The maximum velocity of the current occurs about two hours after high and low water.

Wave ... Nusa Kambangan which rises to an elevation of about 200 meters is located in the south of Kali Donan, and plays the role of the natural breakwater. The width of Kali Donan is only a few hundred meters,

and the fetch of the south-east monsoon is very short. Therefore the proposed jetty construction area is very calm.

4-1-5 Earthquake

Jawa is located at the eastern tip of the earthquake belt which stretches from the Mediterranean Sea to the Pacific Ocean. Earthquakes occur very often. The biggest one occurred on July 23, 1943. The seismic center was about 140 km south-east of the town of Cilacap and 60 km in depth. The magnitude was estimated at 7.8 (Ms).

Estimating from this magnitude, the design intensity of earthquake is properly 0.15.

4-2 Present Conditions and Future Plans of Cilacap Port

The Cilacap Port is the only port which faces the Indonesian Sea (Ocean) in Jawa Island and it serves as an important port in the Island.

All marine cargoes in the Province of Central Jawa are handled at Semarang Port and Cilacap Port. Mainly, the cargoes coming from the northern area of the Province are handled at Semarang Port and the cargoes coming from the southern area at Cilacap Port.

With the water channel flowing north-south, the Cilacap Port is situated at the river mouth which is at the south end of Donan River, and at the river mouth, the Kambangan Island, and island of approximately 30 km. in total extension lies east-west, serves the purpose of shelter against the ocean. Accordingly, this water area is very calm and becomes a port being favored with natural conditions. However, the improvement of port facilities has fallen behind, and the cargo handling of the existing facilities being over the capacity limit, the vessel stoppage in the port is excessively long due to port congestion. Under the present

situation, it is expected that superannuated facilities be repaired and new improvements be made by equipping the port with new facilities.

4-2-1 Wharfs

The Cilacap Port has the public wharf as the main wharf and several other private wharfs, and their conditions are reported, as hereunder.

The public wharf has 4 berths (total length is 530 m.), 1 berth being damaged and 3 berths being capable of vessel's berthing and cargo handling. Among the 3 berths, only 1 berth is capable of berthing 10,000 - 15,000 DWT size vessels and the others are only capable of berthing vessels of 5,000 DWT size.

The private wharfs are owned by the important enterprises in the Area, Pertamina, Semen Nusantara and Aneka Tamban, and these wharfs are used for shipping out manufactured products and receiving raw materials of the respective companies.

Table 4-1 The conditions of the above wharfs are, as follows:

Name of Berths	Nos. of Berths	Max. Size Vessel	Draft	Remarks
Public Wharf	4	15,000	10	Transporting in/out of hinterland cargoes
Pertamina Private Wharf	3	35,000	11	Receiving crude oil
"	1	3,000	6	Shipping out of refined oil
Semen Nusantara Private Wharf	1	8,000	6.5	Shipping out of cement
Aneka Tamban Private Wharf	1	8,000	11	Shipping out of iron sand

4-2-2 Handled Cargoes at the Port

The trend of Cilacap Port's volume of handled cargoes is shown in the table below. In 1979, the volume reached approximately 6,700,000 tons, of which 750,000 tons (11.2%) of the cargoes were handled at the public wharf and 5,900,000 tons (86.4%) at the private wharfs.

Unit: 1,000 tons

Name of Wharfs	1975	1976	1977	1978	1979
Public Wharf	329	287	330	579	747
Pertamina Private Wharf	975	2,067	4,934	5,225	5,773
Semen Nusantara Private Wharf				61	146
Aneka Tamban	315	294	240	91	14
Total	1,619	2,647	5,504	5,956	6,680

The trend of handled cargoes in 4 years from 1975 to 1979 is an increase of 2.3 times at the public wharf and an increase of 4.6 times at the private wharfs, indicating the extreme increase of the latter. Furthermore, the increase of total cargo volume is 4.2 times.

With respect to the main commodities handled at the respective wharfs are reported hereinafter.

The main commodities handled at the public wharf are feeds (export), rice (import), cement (transport out) and fertilizer (transport in), and the shares in percentage of these commodities are shown below.

Table 4-2 Rate of Main Commodities Handled in the Total Handled Cargoes (1979)

Unit: %

Item	Total Cargo Volume	Export	Import	Transport Out	Transport In
Feeds	18.1	74.8	0.2		
Rice	13.5		70.1		
Cement	23.4	21.8		99.9	
Fertilizer	38.9	2.5			99.5
Total	93.9	99.1	70.3	99.9	99.5
Others	6.1	0.9	29.7	0.1	0.5

The cargoes handled at the private wharfs are raw materials and manufactured products of respective companies, namely, Pertamina's oil and relevant products, Semen Nusantara's cement and Aneka Tamban's iron sand.

4-2-3 Vessels Entering the Port

In 1975, 337 vessels entered the Cilacap Port, and in 1979, 542 vessels entered the Port, which is an increase of 1,6 times in 4 years period. With respect to the types of vessels, tankers entering the Port have sharply increased in recent years, showing a record in 1979 in which tankers shared 62% and freight cargo vessels and specialized carriers shared 33%. With respect to the number of foreign trade cargo vessels and domestic cargo vessels, the former entering the Port were greater in number in the past, but from 1977, the situation has been reversed, and presently the latter are greater in number.

The size of vessels entering the Port are, on the whole, tankers of 20,000 DWT and freight cargo vessels of approximately 8,000 DWT, and

it is assumed that the loaded tonnage rate of the tankers is nearly in full-load condition and freight cargo vessels is about 70 - 80%.

4-2-4 The Bottleneck of the Present Situation

With respect to the bottleneck of the present situation of the Cilacap Port, the points in question, mainly, of the public wharf are, as follows:

1. Superannuation of mooring facilities
2. Lack of up-to-date facilities
3. Overall shortage of facilities
4. Retarded countermeasures for large-sized vessels

4-2-5 Future Plans of the Cilacap Port

The future plans of the Cilacap Port which are decisive at the present stage are, as follows:

1. Improvement of the Public Wharf

In order to cope with the increasing volume of cargoes, the improvement of the public wharf is essential. Number of repair works are planned in the 3rd Five-Year Plan, but no rapid improvements of the wharf can be expected with such measures.

2. New Construction of Pertamina's Crude Oil Receiving Berth

With the expansion of refining capacity of Pertamina's refinery, the new construction of crude oil receiving berth has become essential, and it is planned to newly construct 2 berths for accommodating 100,000 DWT large-sized vessels. The projected site is in Kambangan Island near the present Port, and the construction work is scheduled to commence at the end of 1980 and to be completed in 1983.

3. New Construction of Semen Nusantara's Shipping Berth for Manufactured Products.

Shipments of Semen Nusantara's cement products are presently being handled at the Public Wharf and Vidjapra Private Wharf; however, the handling capacity of the above wharfs has already reached the limit. Accordingly, in order to cope with the increased production with the construction of the factory's new kiln, Semen Nusantara is planning to construct their own berth, enabling smooth marine transport of large volume of cargoes. Moreover, this new berth will be open for public utilization to some extent, aiming to contribute in easing the congestion of the Cilacap Port.

4-3 Semen Nusantara's Construction Plan of New Harbor Facilities

4-3-1 Functions of Project Harbor Facilities

In comparison with the volume of cargoes handled at the Public Wharf, the berths being short in extension, cargo handling is presently being executed with day and night shifts, and the handling capacity has already reached the limit. As of this result, the Port's cargo handling is being hindered due to extreme vessel stoppage and frequent berth shifts.

In view of the situation, Semen Nusantara's construction of their new harbor facilities, in consideration of the Public Wharf's cargo handling capacity, is planning to promote smooth flow of the company's marine cargoes with the expected increase from the increased production of cement as well as to contribute to the smooth flow of the Area's harbor commodities by handling manufactured products of paper and pulp factory, which is expected to be established nearby the industrial area adjacent to Semen Nusantara, and a part of general merchandise.

Accordingly, the characteristic point of the project harbor facilities aims to utilize the facilities as the private wharf of Semen Nusantara; however, the facilities also will function commercially for the benefits of the Area.

4-3-2 The Scale of the Project Harbor Facilities

The scale of the project harbor facilities is essential in handling cement products and also a part of general cargoes when the production basis of cement reaches 2,000,000 tons per year in 1988. In the event that production basis of cement reaches 2,000,000 tons per year, the handling volume of cargoes at the projected berth of private wharf would be approximately 850,000 tons. If calculation is performed at 300 operating days per year, 24 hours of utilization per day, with capacity of 300 - 600 tons/hour (cement in bags and in bulk) cargo handling equipment and with capacity 12 - 20 tons/hour/gang ship's derrick, the berth utilization rate of the cargoes at this private wharf would be 0.47 per berth, and full cargo handling would be possible; simultaneously, capacity would be left in handling other general cargoes.

Accordingly, 1 berth should be constructed with the scale of facilities to accommodate 15,000 DWT size cement carrier for export.

4-3-3 The Target of Cargo Handling Volume

The cargo handling time of cargoes handled at the public wharf should be 16 hours with 2 shifts per day, and the time of cargoes handled at the private wharf should be as reported hereinbefore. The table below shows that in the event that the target of cargo handling volume is calculated with the target of berth utilization of 0.7.

Table 4-3 Target of Cargo Handling Volume of Project Berth

Unit: 1,000 tons

	1983	1984	1986	1988
Cargoes to be Handled at the Private Wharfs	134	656	776	849
Cargoes to be Handled at the Public Wharfs	125	80	65	50
Total	259	736	841	899

Moreover, the table below shows the rate of the berth's possession in such situation, and the extent of the project berth's contribution to public can be well-observed.

Table 4-4 Rate of Berth's Possession of Project Berth

Unit: %

	1983	1984	1986	1988
Cargoes to be Handled at the Private Wharfs	21.7	50.0	60.7	67.7
Cargoes to be Handled at the Public Wharfs	78.3	50.0	39.3	32.3

4-3-4 Selection of Proposed Site of Berth

As the proposed site for the new berth construction to accommodate 15,000 DWT size vessels, the following 2 districts can be taken into consideration:

- (A) New construction in the vicinity of Semen Nusantara Cement Factory
- (B) Enlargement of Vidjapra Private Berth

From the above proposed sites, selection should be made in comparison of overall aspects, namely, the location and accessibility of cement

factory and public wharf, the conditions of utilized land in the rear of proposed site, the easy access to utilization of facilities, the initial capital investment and running costs and the influential effects brought about to the Area with the construction of harbor, and the site should be under favorable conditions by being adjacent to the water area of the existing limestone receiving berth in the vicinity of cement factory.

4-3-5 Facilities Plan

In this report, the general plan of the harbor facilities chiefly will be pointed out as facilities plan.

1. The General Plan of Objective Vessel

In the facilities plan, the objective vessel is 15,000 DWT size vessel, of which the general plan is, as follows:

- ° Overall length of vessel : 162 m.
- ° Molded breadth of vessel : 21.7 m.
- ° Molded depth of vessel : 12.7 m.
- ° Full-load draft : 9.1 m.

2. Waterway

In the upper waterway of the public wharf, the operation of the vessel should be one-side navigation, and the width of the waterway with allowance should be 100 m. which is 1/2 of the vessel's length. The depth of the waterway should be - 9.0 m., which is below the datum level, and in the case of tidal level being below the average level, the navigation of 15,000 DWT size vessel should not be executed until the turn of tide. The time lost due to the turn of tide would not be so great, being 5 - 10 days in a year, and would have almost no effect in the capacity of cargo handling.

3. Anchorage (Turning Basin)

The area of turning basin, needed in turning the vessel by tug-boat, would be a circular area with a diameter of 250 m. which would be 1.5 times the overall length of the vessel. Moreover, the depth of the turning basin should be the same depth of the waterway of - 9.0 m.

4. Mooring Facilities

In consideration of the connection between operation of vessel in relation with the existing raw materials berth and the access road behind the facilities, the center of the berth should be at the spot of about 300 m. from the existing berth in the lower waterway in the vicinity of No. 32 buoy. Furthermore, the face line of the berth should be at a spot of 50 m. from the wharf roughly running in parallel with the wharf.

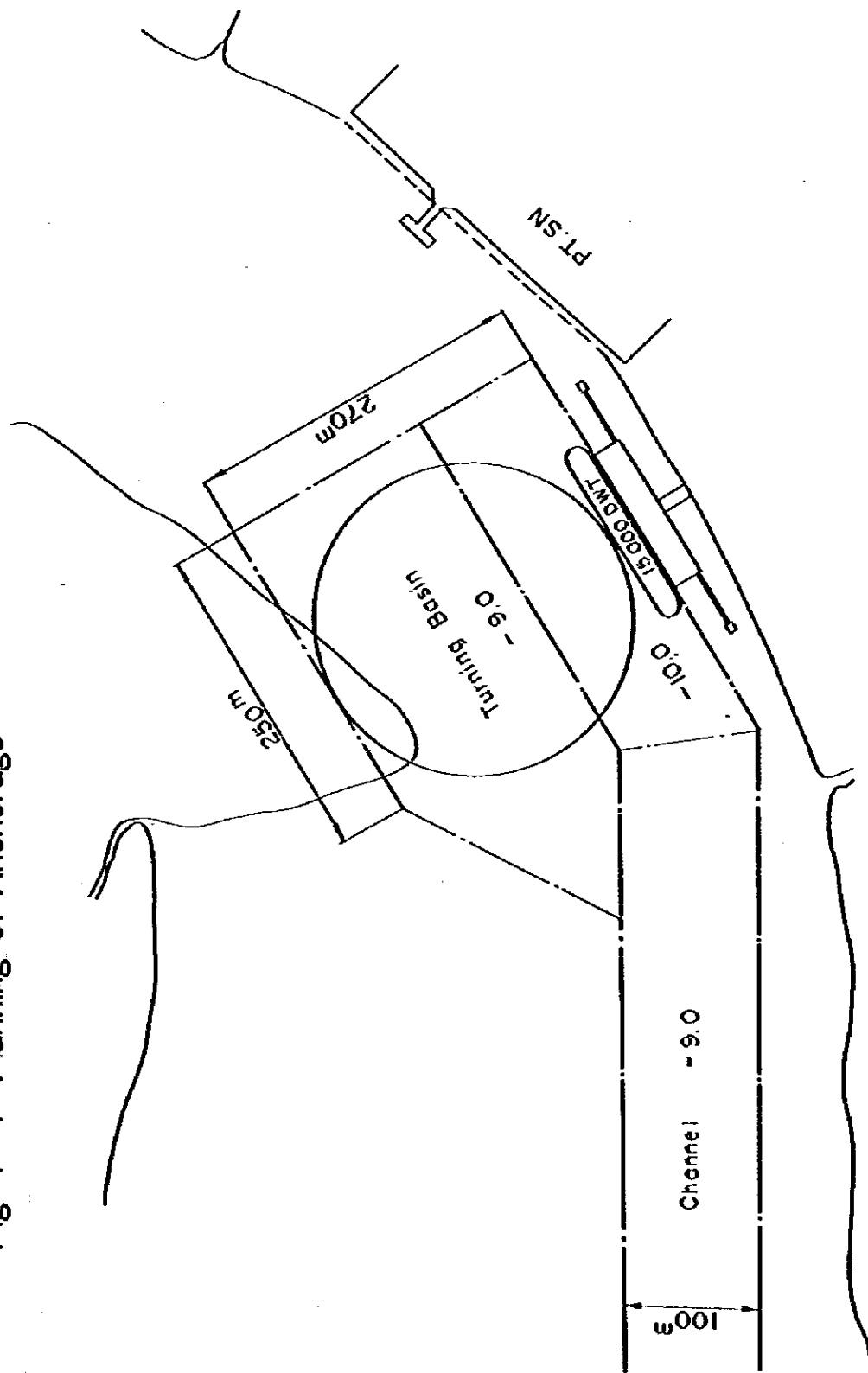
In consideration of soil, flow of the river, etc. of the usual ground, the type of berth should be a steel pipe piled wharf. The structure of the berth would be comprised of the wharf for berthing and handling of cargoes and the dolphin for line handling, and the distance between these 2 facilities would be joined with gangway. Furthermore, in order to execute efficient cargo handling, the length of the wharf of 120 m. would be sufficiently secured for the length of the vessel's hatch. Moreover, the depth at the berth has been planned at - 10 m. so that normal cargo handling can be executed.

5. Summary of Facilities

With the new construction of harbor facilities of Semen Nusantara, the essential facilities are, as follows:

- (1) Waterway : Width ... 100 m. Depth ... - 9 m.
- (2) Anchorage : Circular area with diameter of 250 m.
Depth ... - 9 m.

Fig 4-1 Planning of Anchorage



- (3) Mooring Facilities : Wharf length ... 120 m.
 Wharf width ... 25 m.
 2 dolphins for line handling ...
 Length 5 m.
 Width 5 m.

(4) Access Wharf : Length ... 25 m. Width ... 10 m.

(5) Attached Facilities

- Aids to Navigation (buoy light)
- Warehouse and other structures (warehouse, administration office)
- Truck Terminal
- Facilities for water, electricity and light supplies
- Equipment of cargo handling
- Tug-boat (joint utilization with the Public Wharf)

Moreover, the plan of the harbor facilities plan is shown in drawing

6. Access Road

In order to enable public to use the proposed berth, an access road connecting the existing public road and the proposed berth site should be constructed with a specification sufficient for heavy vehicle.

The southern adjacent area is a village with houses of about 200. The area is categorized to the industrial area in the master plan of Cilacap which was established in 1974, so the area may be used for industrial purpose.

Authority of Cilacap does not have any objection for the access road as well as the berth to be constructed in the area.

In the proposed area, there is no specially important public building except two grave yards, so it may be possible to obtain the necessary land

for the construction of the access road without difficulty.

Majority of the people living in the village, named as Karangtalun, live on agriculture and fishery and about 200 people are employed in the cement factory. A present situation of Karangtalun village is shown in the attached map "A-1".

In this study, the team selected a proposed route considering following conditions:

1) Conditions for Selection of the Road Route

- (1) Convenience for public traffics to the proposed berth
- (2) Minimizing removal of village houses
- (3) Suitable ground condition for the construction
- (4) Minimizing the construction cost
- (5) Securing the site outside of the area for expansion of the cement factory

The team carried out a survey in the proposed area along the road route and the present situation is shown in the attached map "A-2". According to the survey, objects to be removed are as follows:

Object to be removed

Houses	:	15 houses (about 1,314 m ²)
Wells	:	2 pcs
Valuable trees	:	130 pcs

According to the informations from authorities concerned, basis of compensation is estimated as follows:

Compensation for removal of objects

Houses from brick or concrete	Rp 40,000/m ²
House from wood	Rp 20,000/m ²
Coconut tree	Rp 10,000/tree
Well	Rp 50,000/well

Compensation amount estimated based on the above unit price are as follows:

Compensation for land and objects

Item	Unit price	Amount (Rp)
Land for road (7,761 m ²)	Rp 10,000	Rp 77,610,000
Land for berth(7,500 m ²)	Rp 5,000	Rp 37,500,000
Houses (1,315 m ²) ,	Rp 40,000	Rp 52,600,000
Wells (2 pcs)	Rp 50,000	Rp 100,000
Trees (130 pcs)	Rp 10,000	Rp 1,300,000
Total		Rp 169,110,000

According to the legal procedure of land obtaining, projector shall submit an application to the authority concerned then the authority purchase the land from land owners and handle it to the projector.

2) Specification of Access Road

The access road should be designed at the conditions presumed for traffic of heavy vehicles for shipping cargo, as the road will not have essential effect for village people.

The road shall be provided with footways at the both sides with a width of 1.5 m. Despite of the standard specifica-

tions for public road, the access road should be designed properly, where heavier condition is presumed.

The cost of road construction in this study is estimated on an axial load of 15 tons.

Capacity and kind of construction machine available in Cilacap district is limited, so the conventional specification namely "Asphalt Penetration Macadam Pavement" shall be adopted.

The proposed specification shown in Fig. 7-7 is a strengthened one of national highway.

Fig. 7-7 Standard Section of Access Road

Design basis

CBR of road bed : 3

Daily traffic volume : less than 2,000 cars

Table 4-2 Access Road Cross Section

3) Material and Equipment for Road Construction

Materials necessary for the construction of the road with the specification mentioned above are available in Cilacap district as shown below.

For construction of the construction of road, only road roller is essential and it is available in Cilacap.

<u>Material</u>	<u>Origin</u>
Filling earth	Coast in suburb of Cilacap
Crushed stone	Kusugihan (suburb of Cilacap)
Asphalt	Cilacap

CHAPTER 5 CONSTRUCTION PLAN

5-1 Construction Costs

The construction costs excluding contingencies are, as follows:

◦ Harbor Facilities	¥ 1,831,751,000
◦ Access Road	¥ 101,849,000
Total	¥ 1,933,600,000

Furthermore, maintenance and administration costs are, as follows:

◦ Maintenance Costs	¥ 180,000,000 per year
◦ Administration Costs	¥ 54,950,000 "
Total	¥ 234,950,000 per year

5-2 Stage of Work

Schedule of stage of work is indicated in Fig. 5-1.

Fig. 5-1 Work Schedule

Kind of Work	First Year												Second Year					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Access Road	Preparation works																	
	Earthworks																	
	Roadbed works																	
	Pavement works																	
Port Facility	Miscellaneous works																	
	Preparation works																	
	Pile Driving works																	
	Scaffolding works																	
Channel	Forming works																	
	Rainforcing works																	
	Concrete casting works																	
	Miscellaneous works																	
Channel	Preparation and arrangement works																	
	Dredging works																	

June 1981

January 1983



CHAPTER 6 SOCIO-ECONOMY STUDY

6-1 Present Situation of Socio-Economy in Indonesia

6-1-1 Population and Labor Force

Republic of Indonesia is consisted of islands more than 13,000 with area of 2,020 thousand square kilometer and its population is about 139 millions in 1979.

The population is fifth in the world and following 3 points are important factors in development of the country.

1. Sharp Increase of Population

Present growth of the population is 2% and it is not so high among the developing countries. The population in the final year of PELITA-III (1983/1984) will be more than 150 millions increasing 3 millions annually. This sharp growth of the population will be burden to the economy of Indonesia unless domestic agricultural production will not increase because import of food material affect flowing out of foreign currency.

2. Distribution Unbalance of Population

Average population density of whole Indonesia is not so high (75/km² in 1979), but 63% of population is concentrated in Jawa which shares only 7% of the land area. So the population density of Jawa is extremely high as 644/km², and it seems to be one of the reasons of fertility decrease of land.

Table 6-1 Increase of Working Population

(Unit: 1,000)

Year	Working population
1978	54,826
1979	56,079
1980	57,304
1981	58,525
1982	59,904
1983	62,273

Increase for 1978 - 1983 : 6,447 thousand persons

Increasing ratio for year : 2.2%

Table 6-2 Density of Population

	Area (x 1,000 km ²)	Population (million)		Density (Population/km ²)	
		1978	1983	1978	1983
Jawa	135	(63.5%)87	(63%) 45	644	704
Outside Jawa	1,892	(36.5%)50	(37%) 56	26	30
Indonesia	2,027	(100%)137	(100%)151	68	75

3. Population Distribution by Age

Characteristics of population in Indonesia is young, where, the younger than 14 years old is 42.1% and the younger than 25 years old is more than 50%.

This fact means that the proportion of working population is small but it grows by a ratio higher than growth of whole population.

In the PELITA-III, growth of working population is estimated to be 2.2% annually.

Hence, it is required to provide food and accommodation with the people increasing by 3 millions annually and to create employment for 120 thousand people every year.

Table 6-3 Estimation of Population

Year	Population (x 1,000)
1978	136,630.7
1979	139,376.3
1980	142,178.8
1981	145,028.8
1982	147,939.7
1983	150,900.8

Table 6-4 Distribution of Age

Age	%
0 ~ 14	42.1%
15 ~ 55	53.0%
60 ~	4.6%

6-1-2 Industry and Income

1. Agriculture

About 60% of population of Indonesia are employed in agriculture and the share of agriculture in gross national income is 34.1% as of 1978, which is highest among sectors (refer to Table 6-5).

The growth ratio during 1973 - '78 is relatively low at 3.5% annually comparing with other industry. Migration is important for improvement of productivity being low because of plowed area.

2. Industry

Industry has highly increased by 13% annually for 1974 - 1979 since 1960s, and it has reached to a share of 12.3% in 1978.

Agricultural population shares 9.4% according to the sensas in 1976.

During 1960s and 1970s, the industry performed the growth mainly in conversion of import, and for 1970s and 1980s high growth more than 10% is expected for higher conversion of import and integrated processing of materials.

Since the growth in agriculture sector is estimated to be relatively low at about 3%, industry has to play an important role for the growth of the national economy of Indonesia especially in creation of employment.

3. Mining

Production of petroleum in 1979 was about 500,840 thousand barrels and production of natural gas is expected to increase continuously from now on.

Owing to the price increase of petroleum, income from petroleum is increasing every year and it shares constantly more than 50% in export of Indonesia.

As to other natural resources, 30,000 tons of tin, 60,000 tons of copper and 1,200,000 tons of nickel were produced in 1979.

Mining shares 11.08% of GNP and its average annual growth rate is 4.6% during 1973 - 1978.

Table 6-5 Production and Share
(On market price)

(Unit: Billion Rupiah)

Sector	1975		1976		1977		1978	
	Share (%)		Share (%)		Share (%)		Share (%)	
Agriculture	2,811	36.8	2,944	36.1	2,990	34.1	3,204	34.1
Mining	828	10.9	952	11.1	1,010	12.2	1,040	11.1
Manufacturing	848	11.1	930	11.4	1,010	11.5	1,159	12.3
Electricity, Gas, water supply	41	0.5	46	0.6	49	0.6	53	0.6
Construction	365	4.8	385	4.7	457	5.2	494	3.3
Trading	1,294	17.0	1,351	16.6	1,446	16.5	1,563	16.6
Transportation/communication	303	4.0	343	4.2	404	4.6	451	4.8
Banking	102	1.3	117	1.4	95	1.1	107	1.1
Realty	198	2.6	209	2.6	249	2.8	268	2.9
Government services	564	7.4	596	7.3	701	8.0	756	8.0
Other services	277	3.6	284	3.5	290	3.3	297	3.2
Total	7,631	100	8,156	100	8,761	100	9,392	100

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Table 6-6 Export

	Export (Million US\$)	Petroleum/Gas	Price (US\$/barrel)
1975			21.7
1976	6,573	3,710 (56%)	23.5
1977	7,952	4,445 (56%)	26.0
1978	7,989	4,010 (50%)	28.5
1979	13,050	7,100 (54%)	30.5
1980	21,000*		

* estimation

Table 6-7 Estimation of Petroleum and Gas Production

	Natural gas (10,000 m ³)	Petroleum (Million barrel)
1974	606	485.5
1975	239	497.9
1976	344	568.3
1977	633	616.0
1978	813	587.0
1979	1,010	582.0
1980	1,013	572.0
1981	1,049	602.0
1982	1,578	640.0
1983	1,590	668.0

Table 6-8 Budget Distribution by Sector

(Unit: Billion Rupiah)

Sector	PELITA-II		PELITA-III	
Agriculture/Irrigation	1,154	(13.5)/b	3,049	(14.0)/c
Industry/Mining/Energy	1,655	(19.4)	4,118	(18.3)
Transportation/Tourism	1,627	(19.0)	3,384	(15.5)
Manpower development/ Migration	196	(2.3)	1,241	(5.7)
Regional development	1,019	(11.9)	2,143	(9.8)
Education/Culture	763	(8.9)	2,277	(10.4)
Health/Welfare	255	(3.0)	829	(3.8)
Housing/Water supply	193	(2.3)	532	(2.9)
Others	1,680	(19.7)	4,277	(19.6)
Total	8,542	(100.0)/b	21,850	(100.0)

Table 6-9 Gross National Production and Investment in PELITA-III
(1979/80 - 1983/84) (On present price)

(Unit: Billion Rupiah)

	78/79	79/80	80/81	81/82	82/83	83/84	
GNP	23,165	26,920	30,675	34,955	39,835	45,390	-
Total invest.	4,915	6,195	7,345	8,435	9,700	11,145	42,835
Budget	2,455	3,488	3,892	4,350	4,778	5,341	21,849
Other	2,460	2,707	3,453	4,100	4,922	5,804	20,986
Proportion Budget/GNP	21.2%	23.0%	23.9%	24.2%	24.4%	24.6%	-

Table 6-10 Change of Industrial Structure in PELITA-II and PELITA-III

	Proportion of GNP by Sector/a			Growth Ratio	
	PELITA-II 1974/'75 - 1978/'79	PELITA-III 1979/'80 - 1983/'84	PELITA-II/b 1974/'75 - 1978/'79	PELITA-III/c 1979/'80 - 1983/'84	Annual growth (%)
	Proportion (%)				
Agriculture	32.7	31.1	31.4	27.2	3.8
Mining	22.2	17.8	17.9	15.9	4.8
Industry	8.3	9.3	10.2	12.6	12.7
Construction	3.8	5.2	4.9	5.5	13.0
Transportation & Communication	4.1	4.7	4.6	5.4	11.3
Others	29.3	31.9	31.0	33.4	8.4
Total	100.0	100.0	100.0	100.0	6.9
					6.5

Note: /a at current price

/b at constant price as of 1973

/c at constant price as of 1978/1979

6-2 Investigation on Material Flow in Cilacap District

6-2-1 Present Flow

Cilacap port is only one deep port along the southern coast of Java and it dealt with a cargo of 6,680 thousand tons in 1979. The 86% of the cargo was petroleum and relevant material of PERTAMINA and almost all of the cargo was handled at its private berthes through pipe lines. So investigation on the PERTAMINA's material is excluded from this study, and the material flow of marine transportation is also excluded as it is explained in Chapter 4 in detail.

Inland transportation in the district relies on road and railway and its ratio is 2 : 1.

The material flow amounts to approx. 1,820 thousand tons annually in 1979, where, road transportation and railway transportation are approx. 1,230 thousand tons and approx. 590 thousand tons respectively.

Outflow from Cilacap district to other areas of Central Java is 1,030 thousand tons and the inflow is 180 thousand tons.

Major items of the outflow are fertilizer (280 kilo tons) and rice (100 kilo tons) which were unloaded at the public port, and cement (485 kilo tons) and asphalt (86 kilo tons) manufactured in Cilacap.

Major items of the inflow are cassava (1,354 tons) and silicasand (43,000 tons) as a cement material.

And major parts of the material flows inside Cilacap are cement and raw material for cement production such as clay, and gypsum.

They are shown in Table 6-11.

Table 6-11 Material Flow in Cilacap

(Unit: Ton)

Outflow from Cilacap		
Item	Road	Railway
Fertilizer	165,600	124,800
Asphalt	56,000	29,760
Cement	305,000	180,000
Rice	88,150	12,600
Bulgur	6,000	
Iron Sand	53,554	
Textile	4,700	
Dryseeds	4,222	
General cargo	1,874	
Petroleum		
Total	685,100	347,160

(Unit: Ton)

Inflow to Cilacap		
Item	Road	Railway
Cattle food	110,200	25,000
Silica sand	-	43,500
Mangan	1,548	
Shrimp	1,500	
Total	113,248	68,500

(Unit: t)

Flow inside Cilacap		
Item	Road	Railway
Clay	243,750	-
Cement	146,200	174,746
Gypsum	25,247	-
Ironsand	83,000	-
Cotton	5,000	-
Craft paper	4,504	-
	435,781	174,746

6-2-2 Future Prospect of Material Flow

An increase of material flow is prospected due to the planned expansion of the cement factory, oil refinery, and the establishment of the pulp factory.

Required inland transportation for the cement factory is presumed as 600 kilo tons in 1984 and 1,000 kilo tons in 1988 (Table 6-12) in accordance with the expansion program where the production capacity is increased to twice in 1984 and to 3 times in 1988.

Table 6-12 Estimation of Material Flow in Cilacap

1. Outflow

(Unit: 1,000 T)

Item	1984	1988
Cement	600	1,000
Asphalt	180	180
Others	670	1,200
Total	1,450	2,380

2. Inflow

(Unit: 1,000 T)

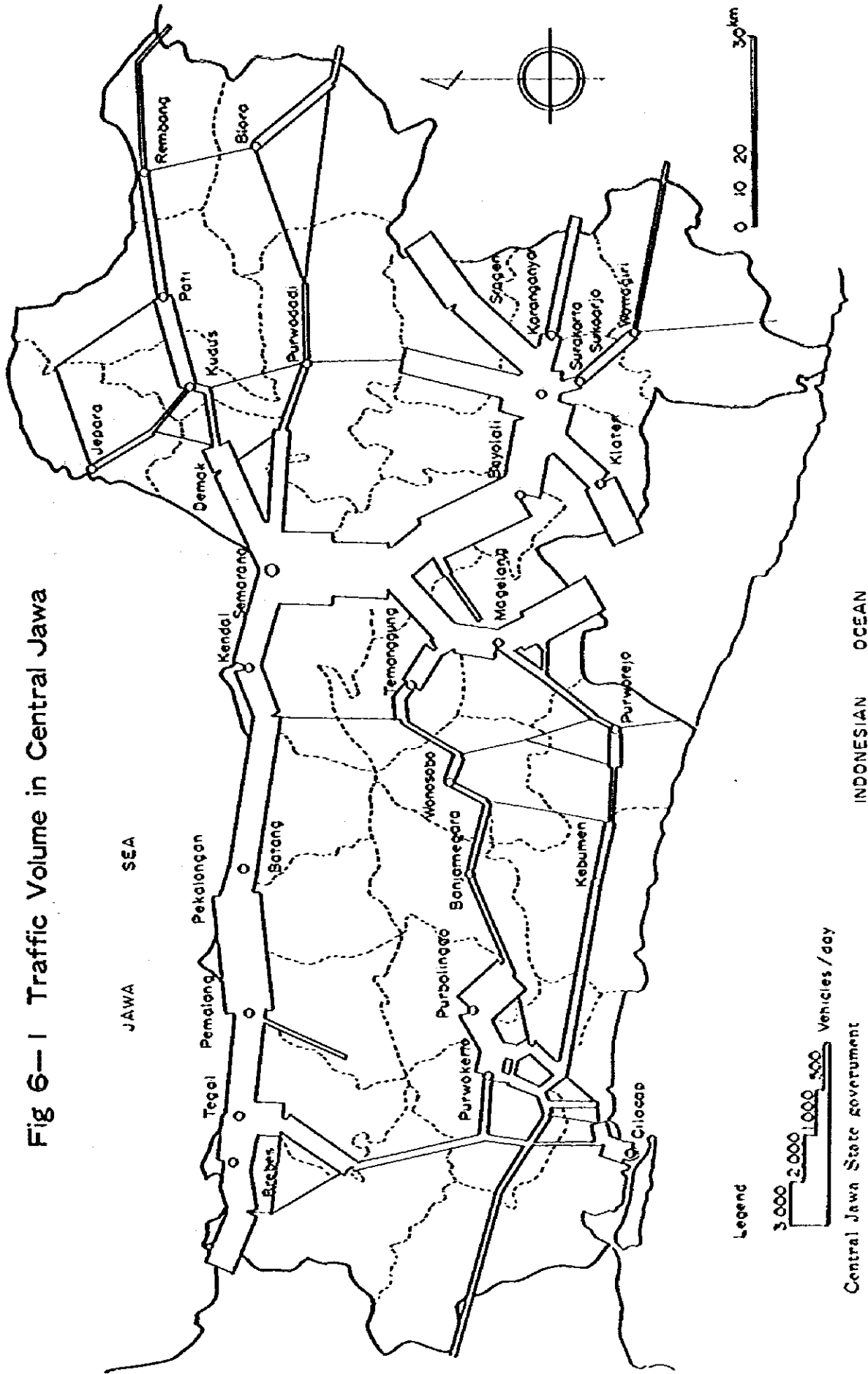
Item	1984	1988
Timber	150	150
Silica sand	120	120
Other	200	360
Total	470	630

3. Inside Cilacap

(Unit: 1,000 T)

Item	1984	1988
Cement	140	220
Clay	280	720
Ironsand	20	30
Others	100	150
Total	440	1,120

Fig 6-1 Traffic Volume in Central Jawa



6-3 Present Situation and Future Prospect of Infrastructure in Cilacap

6-3-1 Traffic Network

1. Road

Total length of the road in Cilacap district is 375 km and about 87% of the road is paved with asphalt.

The road classified in "good" condition was 34 km in 1976 and it has increased to 298 km in 1978.

The Cilacap - Bandung line, which has unseparated 2 lanes, is now under improvement by a financing of ADB and as a result, 8 tons truck can be used and traffic hour can be shortened.

The traffic volume is about 1,000 cars per day according to a survey in 1976.

The Cilacap - Jogjakarta line is also unseparated 2 lanes with a traffic volume of about 1,000 cars a day. A bridge over the Surayu river with a loading capacity of 4 tons and with one lane is a bottle neck of the line. For improvement of the condition, a new bridge is being constructed, completion of which is expected in 1982.

The Cilacap - Tegal is also unseparated 2 lanes and has traffic volume of about 1,000 cars a day.

Number of registered cars in Cilacap is 1,245 in 1979 and that means a car per 1,046 of population. It is relatively lower than the national average, but it is increasing sharp recently as shown in Table 6-14.

A remarkable increase of truck is observed during 1978 and 1979 at a rate of 68%, where, number of truck increased from 386 upto 838 (approx. 2.1 times).

This increase was mainly due to increase of inland transportation for the oil refinery and the cement factory.

For reference, traffic volume in the main road from 6 AM to 6 PM is 1,035 cars of inflow and 1,354 cars of outflow, and in another road in front of the cement factory, 445 cars of inflow and 413 cars of outflow.

The situation of the traffic volume is shown in Fig. 6-1.

Table 6-13 Road Condition in Cilacap District

(Unit: km)

	Good	Moderate	Damaged	Severely damaged	Total
1975	34.4	49.5	112.18	153.1	345.6
1976	50.7	53.2	97.2	144.5	345.6
1977	276.8	35.0	41.2	21.2	374.3
1978	298.6	35.1	29.5	11.2	374.6
1978	(Asphalted) 324.7	(Gravel) 25.8	(Earth) 23.9		

Table 6-14 Number of Vehicle Registered in Cilacap

	1974	1975	1976	1977	1978	1979
Bus	42	42	39	46	56	59
Truck	275	369	383	360	386	838
Van	48	57	58	125	205	256
Other	6	46	66	68	93	95
Total	371	514	546	599	739	1245

The traffic may increase as development in Cilacap district, so further improvement is necessary. Especially, improvement of the Cilacap - Yogyakarta line, where the load of truck is limited less than 4 tons, should have high priority.

2. Railway

Railway in Cilacap district is 151 km long in total length consisting of a main line passing from east to west, and two branch lines; Kroya - Cilacap and Kroya - Purwokerto line. Kroya - Cilacap line has 4 passenger trains and 5 cargo trains daily and it transported 24,960 passengers in 1978.

Majority of cargo of 500 kilo tons annually was forwarded to Bandung, Yogyakarta, Sulakarta and Semarang, and the cargo is cement (57%), fertilizer (39.5%), asphalt (9.4%) and rice (4%).

Inflow cargo transported by the railway is a part of cassava (25 kilo tons per annum) which is produced in Central Java and silica-sand (40 kilo tons per annum) as one of cement raw material shipped from suburb of Semarang.

Transportation charge in the railway tariff (Table 6-15) is relatively low for longer distance than 250 km comparing with truck transportation charge, as another truck transportation is required after railway transportation even for shorter distance.

Actually, railway is used for long distance transportation.

3. Port

Cilacap port is only a fine port in the south coast of Java and it has 4 public berthes and 5 private berthes and handled 6,680 kilo tons of cargo in 1978.

(The details is referred to Chapter 4.)

Fig 6-2 Rail-Way Net-Work in Central Jawa

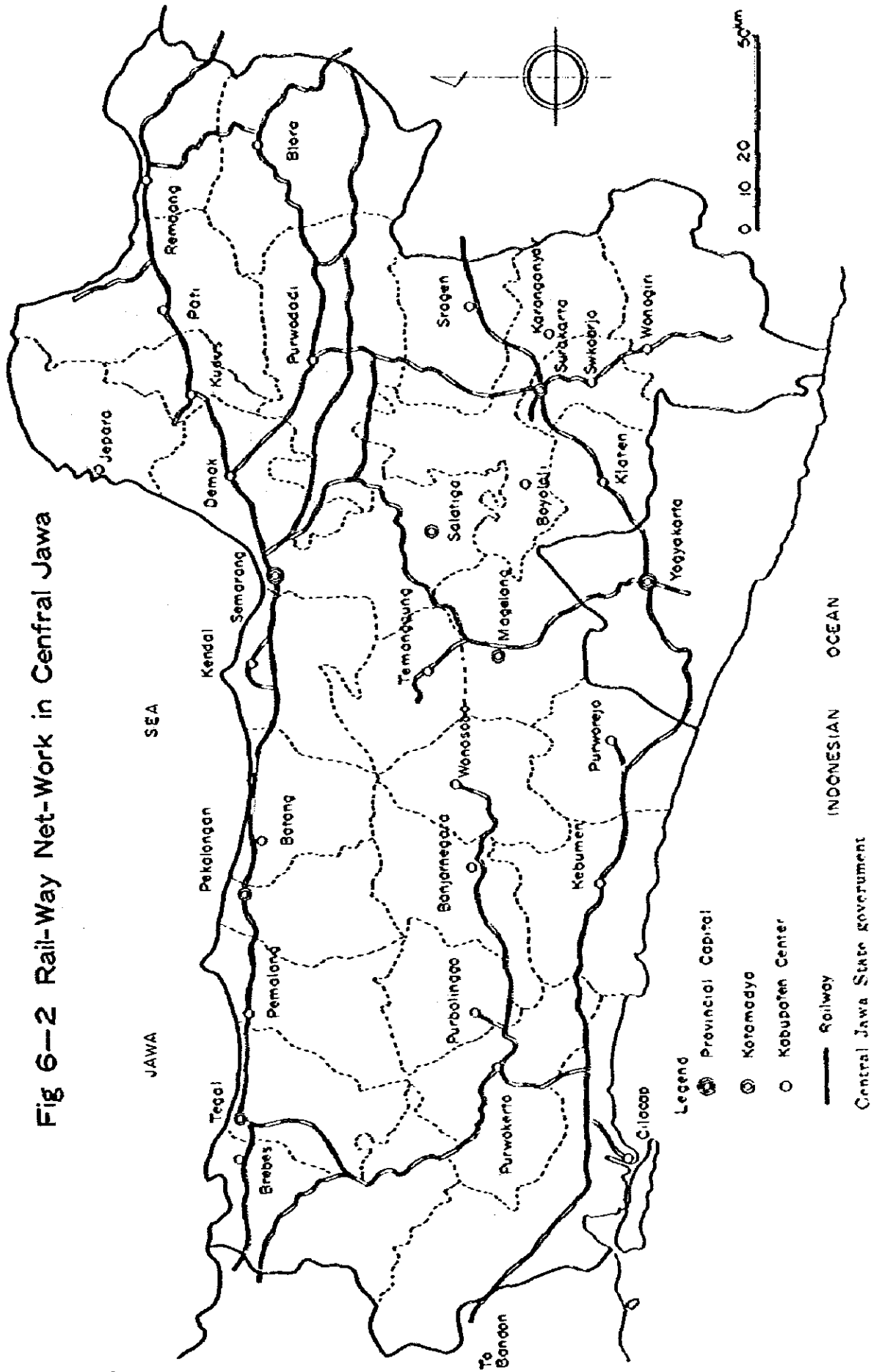


Table 6-15 Tariff of Railway and Truck

(Rp/T)

Route	Distance km	Railway	Truck
Inside Cilacap Pref.	0 ~ 50	1,060	2,125
Cilacap ↔ adjacent pref.	50 ~ 100	1,500	2,125
Cilacap ↔ Yogyakarta	171	2,308	3,875
Cilacap ↔ Bandung	250	3,008	4,625
Cilacap ↔ Jakarta	407	4,769	7,628
Cilacap ↔ Surabaya	486	5,507	9,125

6-3-2 Utilities

1. Electricity

A transmission line of 150 kV connecting Semarang, Tegal, Purwokerto and Cilacap, and a power receiving station of 40 MW in adjacent area of the existing industrial estate have been provided for the industrial development of the district.

Present power demand is 8 MW in the district; there is rather big surplus in the station.

Electric power generated in Central Java is about 270 MW and other power plants, 200 MW thermal and 120 MW hydraulic, are now being constructed as shown in Table 6-16.

As another transmission line of 500 kV connecting East, Central, and West Java is planned to be set up under a schedule of completion in 1985, the power situation in Cilacap might be improved both in quality and in capacity.

2. Telephone

360 unit of telephone are installed in Cilacap district as of 1980, where one unit per 361 of population.

The diffusion is a little lower than that of whole country (1 unit/352 persons).

The telephone is manually operated, so it requires a few hours to call to Jakarta. 223,500 units of new installation is planned in the PELITA-III; it is 52% increase. As automatization of telephone in Cilacap is planned, it might improve the condition of international telephone call as well as domestic.

As for telex, both international and domestic communication are available without problems.

Table 6-16 Power Plant Project in Central Jawa

Year	Project		Accumulated Capacity (MW)
1978	Semarang Steam-I	1 x 50 MW	195
"	Sempor Hydro	1 MW	196
"	Semarang Steam-II	1 x 50 MW	246
1980	Garung Hydro	2 x 12 MW	270
1981	Wonogiri	12.4 MW	282.4
1983	Semarang Steam-III	1 x 200MW	
1984	Mrica-I Hydro	2 x 60 MW	

Table 6-17 Telecommunication in Indonesia (1979)

1. Capacity

1. Central automatic station	322,000
2. Central manual operation station	108,000
3. Telegram/Telex	397
4. Capacity of central telex station	8,290

2. Frequency

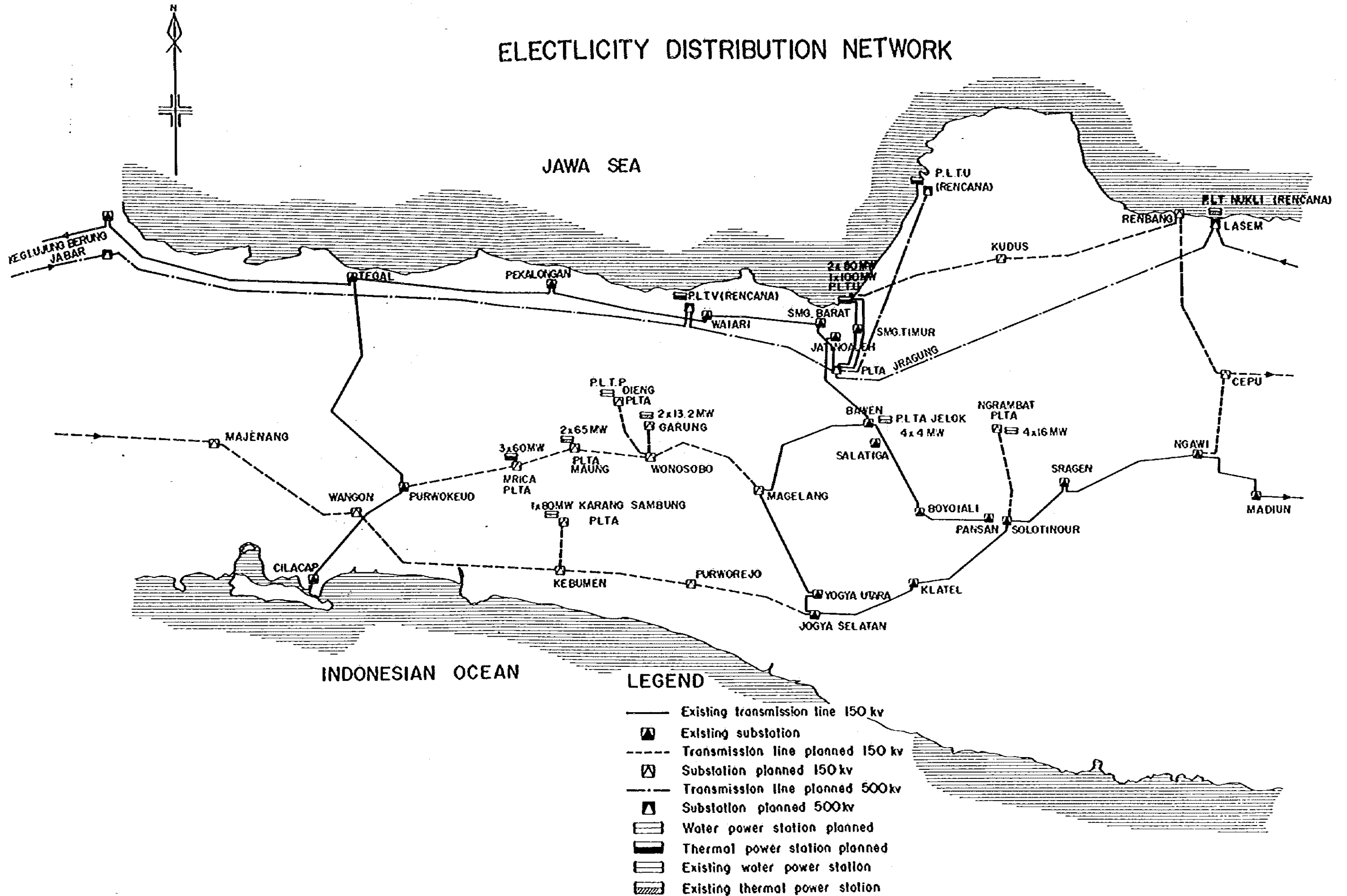
1. Telex	97,958,000
	9,417,000
	107,375,000
2. Telephone	5,367,300,000
3. Telegram (Domestic) (International)	18,208,000
	1,876

3. Water Supply

No public facility has been provided; water for drinking and for industrial purpose depends on underground source.

Underground water level is about 25 m from the ground surface without influence of sea water, and available quantity in a deep well is about 35 m³/day.

ELECTRICITY DISTRIBUTION NETWORK



LEGEND

- Existing transmission line 150 kv
- ▲ Existing substation
- - - Transmission line planned 150 kv
- ▤ Substation planned 150 kv
- · · Transmission line planned 500 kv
- ▥ Substation planned 500 kv
- ▭ Water power station planned
- Thermal power station planned
- Existing water power station
- ▨ Existing thermal power station

At present, a water supply project taking from the Surayu river is progressing by a financing of the Australian Government and completion in February, 1984 is expected. With its completion, about 1,300 tons per day will be available and about half of that can be available for industrial purpose.

6-3-3 Industrial Estate

According to the Cilacap master-plan, the western area of Cilacap peninsula is designated to be used for industrial purpose and the cement factory of P. T. Semen Nusantara, the oil refinery of PERTAMINA and cattle foods factories have been established in this area.

An industrial estate with 78 ha. was constructed in the open space, where electricity, road, water and sewerage facilities have been provided.

The authority concerned is intend to expand the estate upto 240 ha.

As of present, a few small factories such as ice factory are located in the existing estate.

During the period of PELITA-III, other new establishment of 4 or 5 firms out of about 10 firms intended is expected, as the land price is economical (Rp 3,500/m²) and the Ministry of Industry is promoting the development.

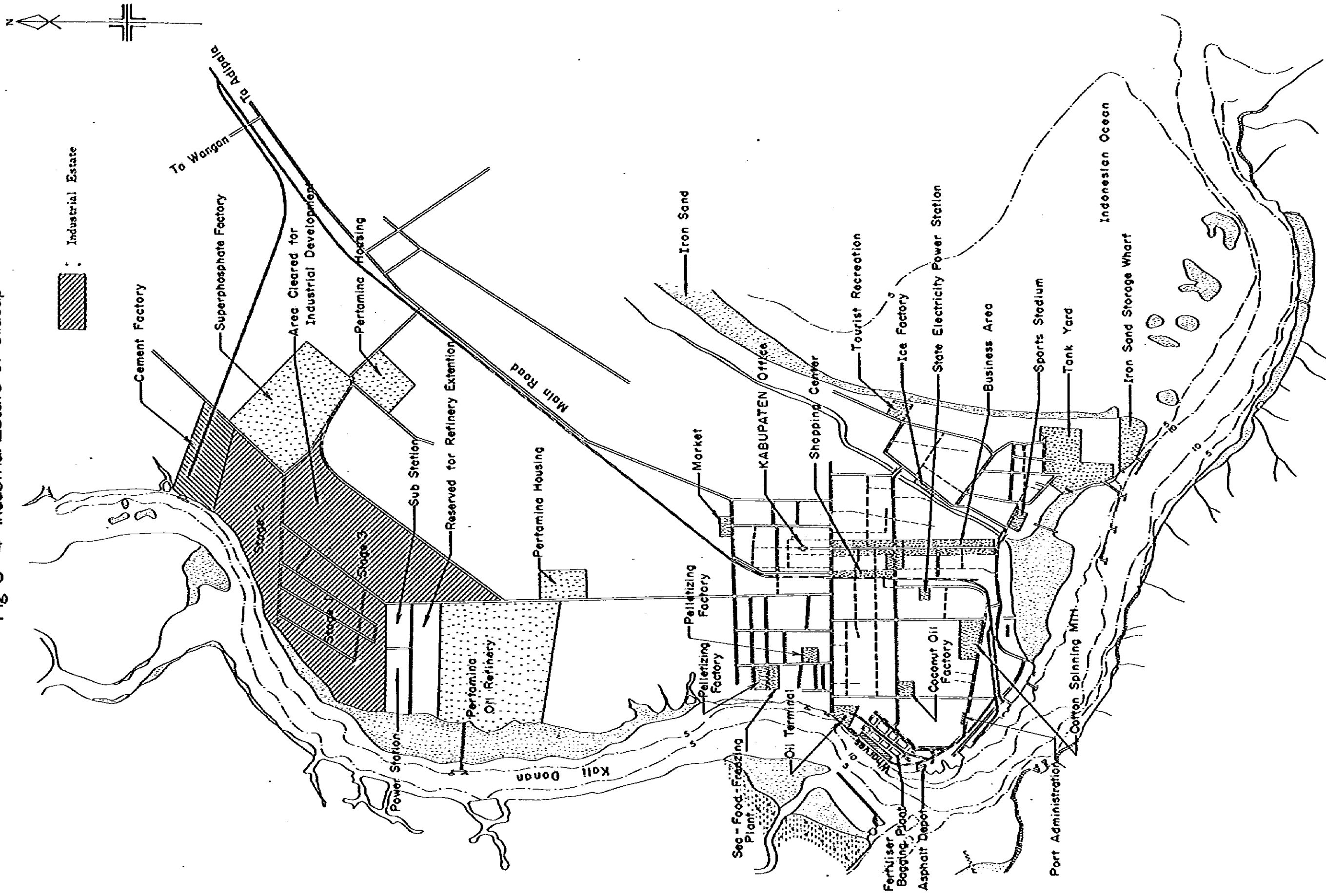
The establishment of the pulp factory in Cilacap has been decided and the location is expected in the industrial estate.

6-4 Circumstances and Problems for Development of Cilacap District

6-4-1 Development of Cilacap District

Cilacap district forms an economical bloc with the prefectures of Purwokerto and Kubumen, as it has the best port in the south coast of Java island. (Refer to Fig. 6-5)

Fig 6-4 Industrial Estate of Cilacap



This economical block is one of the two major development areas; the other is Semarang block consisting of Kudus, Magerang Temanggu and Dien plateau.

The Semarang block might lay stress on trade and agricultural processing and as for Cilacap block, a development in industry and trade of industrial material can be expected due to the availability of deep port.

Development and production per capita in Cilacap have been outdistanced by Semarang block.

Promotion of the development in Cilacap district is significant for the national development policy which aims locally equalized development, as it contributes to raise the position of Central Java to the level same as East Java and West Java.

The development of Cilacap district was planned in the beginning of 1960s and was appointed for a national development area. Then, construction of a fertilizer plant was started in the area of 50 ha. under co-operation of USSR, however, it was suspended on the way after the completion of 50 - 60%.

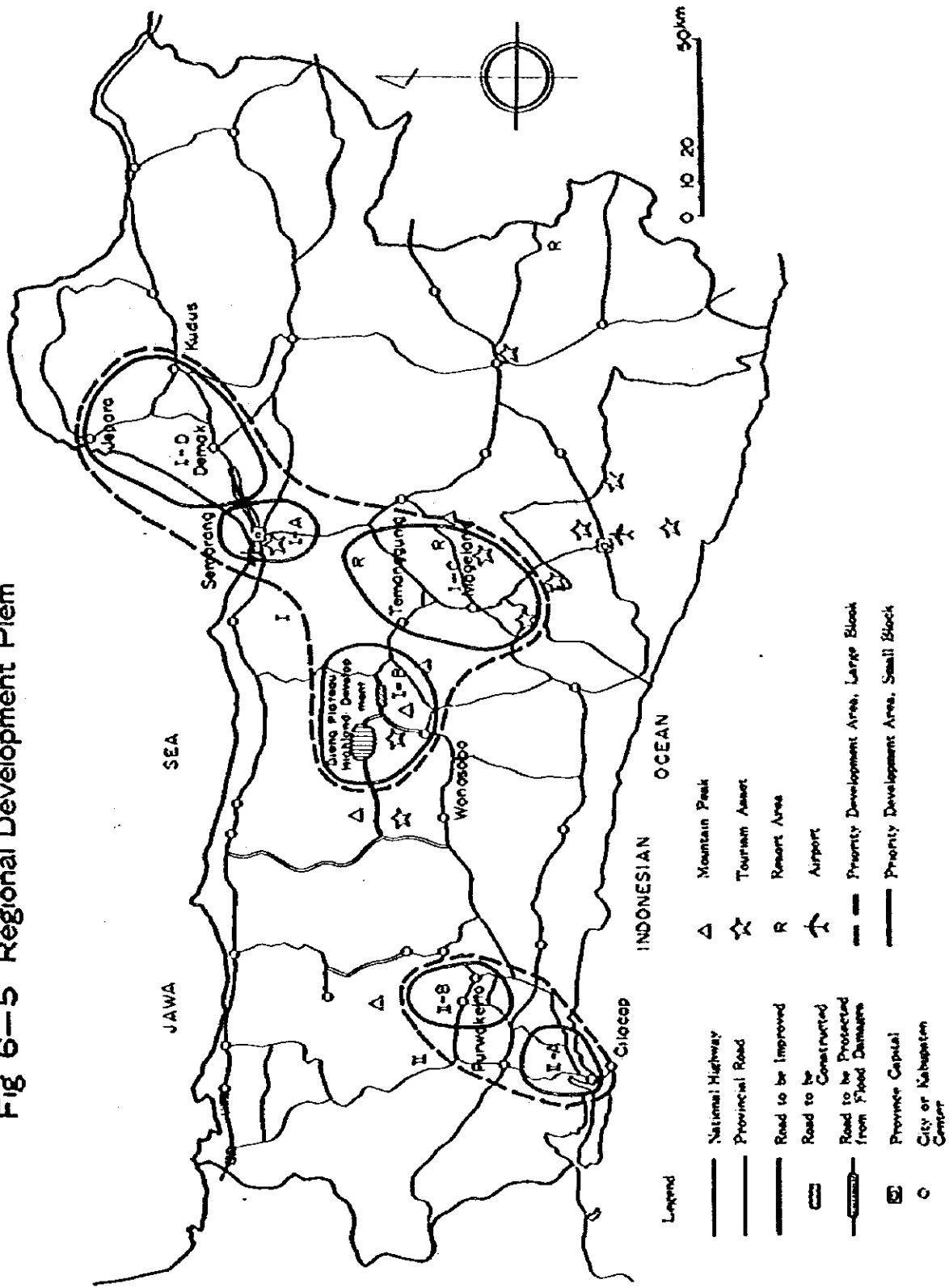
Despite of the attractive port, the industrialization of Cilacap had not progressed till the latter half of 1970s.

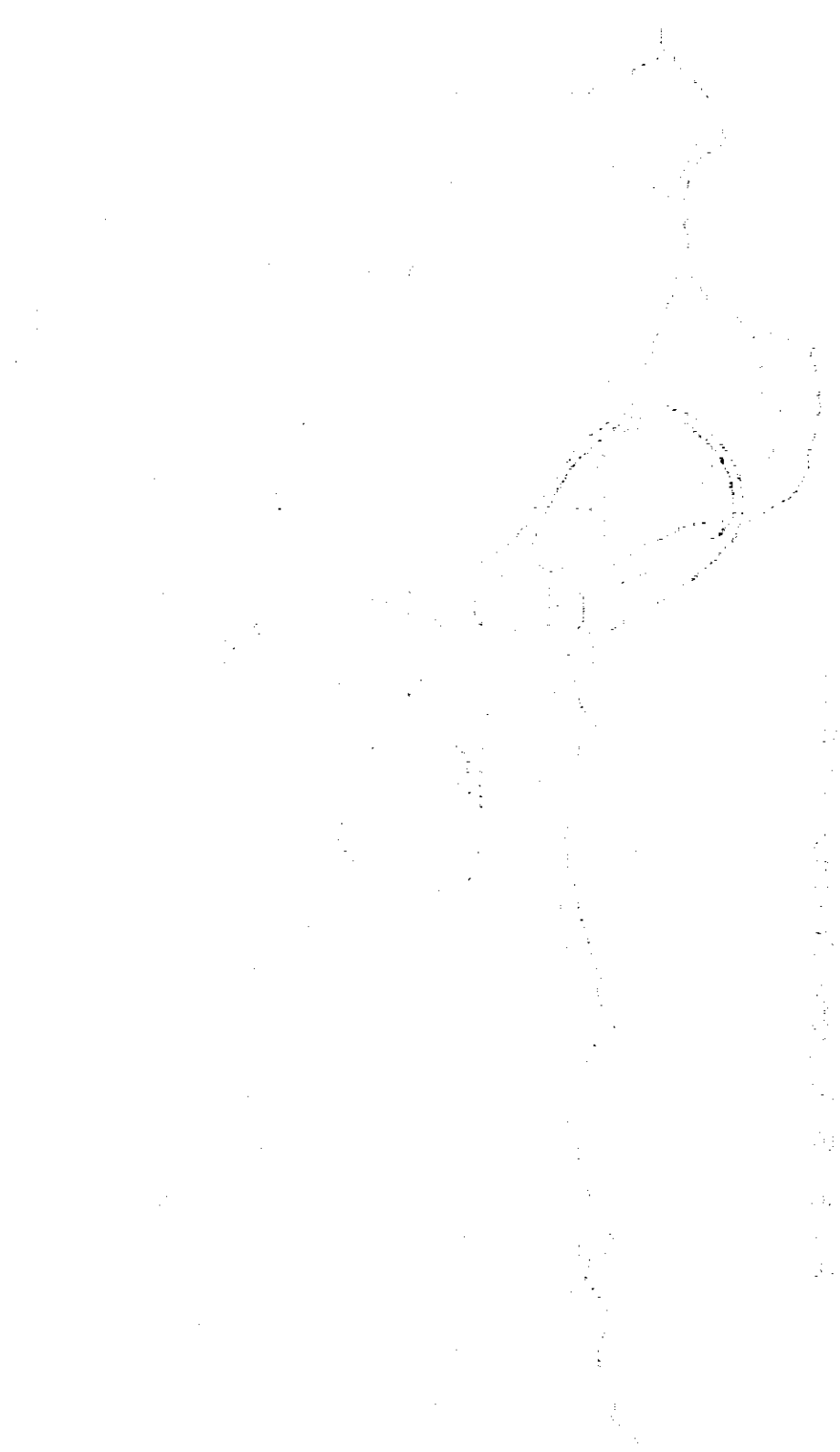
As the reasons of the outdistance, (1) the incompleteness of essential facilities such as electricity, water supply, and road, and (2) the incompleteness of the social facilities such as bank, hotel and other services are pointed out.

As mentioned before, those facilities has been completed in 1970s and the establishment of the industrial estate and the power transmission line were completed and the road improvement has progressed.

During 1970s, the oil refinery, the cement factory and pelletizing factory of fertilizer were established and firms with employees more than

Fig 6-5 Regional Development Plem





100 has increased upto 6.

In the PELITA-III, the water supply project is implemented aiming supply of 6,500 tons/day of industrial water and further improvement of road and telecommunication is planned.

6-4-2 Problems for 1980s

Although the social facilities has been improved, the condition of harbours, which is considered as an attractiveness of Cilacap, might be a serious neck of the development.

As examined in Chapter 4, the quantity of cargo exceeds the ordinary capacity of the port.

On the other hand, improvement of the port is limited to some auxiliary buildings in PELITA-III and any improvement of the berthes are not projected. From this situation, the port aoutholities hope early realization of this project of the new berth construction and the project will contribute to the development of Cilacap district.

6-4-3 Firms Expected

Expansion is expected, as of present, in 4 firms; the capacity will be increased to 300% in the oil refinery and the cement factory, to 200% in the iron sand mine, and 115% in the pelletizing factory of fertilizer.

Establishment of nine new firms are expected and a pulp factory, one of them is being realized. The pulp factory is programmed and budgetted in PELITA-III and it is believed that the factory is located in the existing industrial estate or in the site the abandoned fertilizer factory.

As the both site is near to the projected berth of P.T. Semen Nusantara, the persons concerned in the pulp project hope to use the berth.

It is the most provable for 5,000 t/day of sack paper to be shipped at the proposed berth.

The outline of the proposed pulp factory is as follows:

1. Area for factory : 50 ha.
2. Capacity : 300 t/d in pulp
3. Products : Sack paper
4. Worker : Approx. 550 persons
5. Financing : National budget
6. Projector : PEPUK PERHUTANI and Ministry of Forest
7. Schedule : Feasibility study Jan./1981
Construction 1981 - 1983
Commissioning 1984
8. Products to be shipped : 5,000 - 6,000 t/month

Table 6-18 Expansion Program of Main Firms in Cilacap

	Worker	Production (1979) barrels/day	Production after expansion
1. Oil refinery	1,200	100,000 barrels/day	300,000 barrels/day
2. Cement factory	1,000	750,000 T/year	1,350,000 T/year (1984)
			2,000,000 T/year (1988)
3. Iron-sand	195	80,000 T/year	154,000 T/year (1981)
4. Fertilizer packing	400	80,000 T/year	15% growth annually

Table 6-19 Expected Firms Established in Cilacap

Firms	Area required	Possibility
1. Paper	50 ha	
2. Caster Oil	5 ha	
3. Carbon Black	1 ha	
4. Chemical	1 ha	
5. Alchohole	1 ha	
6. Plastic	1/2 ha	
7. Asphalt Processing	2 ha	
8. Timber	1 ha	
9. Asbest Sheet	1 ha	

Land Price 3,500 RP/m²

- : Most provable
- : Provable
- : Expected

CHAPTER 7 ECONOMICAL EVALUATION

In the former chapters, the necessity of the proposed berth was studied considering the present situation of the existing public port and delivery of the products of the cement factory. Then in this chapter ① location of the proposed berth and ② effects on development and economy for the investor and for region will be studied.

7-1 Construction Cost and Maintenance Cost

In a pre-study carried out by P.T. Semen Nusantara previous to this study, two alternative locations were pointed out, namely ① river side area adjacent to the southern barrier of P. T. Semen Nusantara and ② adjacent area of the private berth owned by P. T. Semen Nusantara.

The team surveyed some places for the proposed berth including the two locations mentioned, and came to a conclusion that the two alternative places are suitable for new berth construction from technical aspect.

Then cost for construction, maintenance and operation were estimated to select the most adequate location of the two.

Basic construction cost for the site near the cement factory is estimated at 1,933,600 thousand yen (Rp 5,312,078,000) on a price basis as of September, 1980 as shown in Table 7-1. The basic cost is adjusted by a quantitative contingency of 10% annually and a price contingency of 10% annually for domestic portion and of 6% for foreign portion. The former contingency is to compensate a volumetric fluctuation due to site conditions and the later is to compensate a price fluctuation due to timelag from estimation to execution.

The estimated total cost is 2,449,230 thousand yen (Rp 7,102,760,000).

Table 7-1 Construction Cost of Berth-A

Item	Construction Cost	
	(Unit: ¥1,000)	(Unit: Rp 1,000)
1 Berth and dredging	1,831,751	5,312,078
2 Access road	101,849	295,362
3 = 1 + 2 Basic total cost	1,933,600	5,607,440
4 Physical contingency	193,360	560,744
5 Price contingency	322,260	934,554
6 = 3 + 4 + 5 Total	2,449,226	7,102,738

Estimated operation and maintenance costs are 234,950 thousand yen (Rp 681,360,000) annually as shown in Table 7-2.

Table 7-2 Average Annual Cost for Maintenance and Operation of Berth-A

Item	Maintenance and Operation Cost	
	(Unit: ¥1,000)	(Unit: Rp 1,000)
Operation cost	180,000	522,000
Maintenance cost	54,950	159,360
Total	234,950	681,360

7-2 Method of Economical Evaluation

7-2-1 Alternative

As the establishment of the new berth is indispensable for the expansion of the cement factory, the feasibility of the expansion of the cement factory itself is not treated in this study, but economically favourable location for the proposed new berth, profitability and public interest of this project are studied. P. T. Semen Nusantara has pointed out two locations for the proposed berth; the one is the adjacent area at the south of the site of the cement factory (hereinafter referred to "Berth-A") and the other is the adjacent area of the existing cement packing plant located in the Cilacap port area (hereinafter referred to "Berth-B").

The JICA Team studied several places including Berth-A and Berth-B for the construction of a new berth and concluded that the two locations are adequate for the purpose.

As an alternative, expansion of the public berth can be considered, however, as it is unrealistic for a private sector, this alternative is dismissed in this study.

The expansion of the public port is not scheduled in PELITA-III (1979/'80 - 1983/'84) and it can not be expected for a quite some time. JICA Team executed a comparison of two best places from the view points of (1) technical (2) economical and (3) public interest.

7-2-2 Comparison of Locations

The above mentioned two locations are herein compared from (1) technical view (2) economical view and (3) public interest.

(1) Technical View

There is no difficulty in construction of the berth and in dredging of the course in both locations.

In case of Berth-B, 750,000 T per year of cement has to be transported by railway from the cement factory to Berth-B. As the capacity of the railway is about 600,000 T per year and supporting transportation by trucks are necessary, stable transportation may be difficult in the plan of Berth-B.

(2) **Economical View**

Construction cost and yearly maintenance and operation cost are estimated as in Table 7-3, and 7-4.

For the plan of Berth-B, cement and relevant material has to be transported inland, so the cost of inland transportation should be a sort of cost of Berth-B.

All cost calculated for 30 years and individually for Berth-A and Berth-B is shown in Table 7-5.

Table 7-3 Construction Cost of Berth-B

Item	Cost	
	(Unit: ¥1,000)	(Unit: Rp 1,000)
1 Berth construction	562,000	1,629,800
2 Dredging	121,000	350,900
3 = 1 + 2 Basic total cost	683,000	1,980,700
4 Physical contingency	68,300	198,070
5 Price contingency	75,130	217,880
6 = 3 + 4 + 5 Total	826,430	2,404,020

Table 7-4 Average Annual Cost for Maintenance and Operation of Berth-B

Item	Cost	
	(Unit: ¥1,000)	(Unit: Rp 1,000)
Operation cost	20,490	59,240
Maintenance cost	180,000	522,000
Total	200,490	581,420

The result of the calculation is summarized in the following table and it shows that Berth-A is more advantageous than Berth-B.

Table 7-5 Present Value of Accumulated Total Cost

(Unit: Rp 1,000)

Item		Berth-A	Berth-B
Construction/	1st year	2,367,580	798,880
	2nd year	4,384,294	1,479,320
Maintenance/ Operation cost	3rd-32nd year	7,102,294	6,060,513
Inland transportation cost		-	5,817,692
Total		13,854,168	14,156,405

(3) Public Interest

As explained in Section 7-7 in detail, Berth-A is convenient for shipping of general cargo, as the location of berth is near both the existing industrial estate and the proposed industrial area.

And bigger vessels are accessible to the existing industrial area located in the western part of Cilacap peninsula by the development of the sea route in the Donan River.

So establishment of Berth-A will play an important role to regional development.

In case of Berth-B, about 40 passages of train are daily expected for the required inland transportation and it will cause traffic difficulty in the town.

From the above study, Berth-A is more advantageous than Berth-B for P. T. Semen Nusantara.

From the view point of regional economy, inland transportation cost for general cargo is added to the mentioned cost of Berth-B, then the advantage of Berth-A to the regional economy becomes higher than to P. T. Semen Nusantara.

7-3 Economical Evaluation of Berth-A

In the former section, it was justified that Berth-A is more advantageous than Berth-B, and an economical evaluation of the project of Berth-A is herein carried out.

As a method of economical evaluation, the principle of "WITH AND WITHOUT" is generally adopted.

However, in case that any alternative investment is required because of that the case of "WITHOUT" is impossible or unrealistic.

Table 7-6 Comparison of Total Cost of Berth-A and Berth-B

Year	Discount rate (8%)	Berth-A				Berth-B					
		Construction	Maint/Operation	Total	Present Value	Construction	Maint/Operation	Transport	Total	Present Value	
1		2,367,580	-	2,367,580	2,367,580	798,880	-	-	798,880	798,880	
2	0.9259	4,735,170	-	4,735,170	4,384,294	1,597,710	-	-	1,597,710	1,479,320	
3	0.8573	-	681,360	681,360	584,130	-	581,420	540,700	1,122,120	961,993	
4	0.7938	-	681,360	681,360	540,864	-	581,420	1,444,320	2,025,740	1,608,032	
5	0.7350	-	681,360	681,360	500,800	-	581,420	309,970	891,390	655,172	
6	0.6806	-	681,360	681,360	463,734	-	581,420	565,070	1,146,490	780,301	
7	0.6302	-	681,360	681,360	429,393	-	581,420	350,970	932,390	587,592	
8	0.5835	-	681,360	681,360	397,574	-	581,420	515,010	1,096,430	639,767	
9	0.5403	-	681,360	681,360	368,139	-	581,420	456,960	1,038,380	561,037	
10	0.5002	-	681,360	681,360	340,816	-	581,420	414,960	996,380	498,389	
11	0.4632	-	681,360	681,360	315,606	-	581,420	386,960	968,380	448,554	
12	0.4289	-	681,360	681,360	292,235	-	581,420	400,960	982,380	421,343	
13	0.3971	-	681,360	681,360	270,568	-	581,420	386,960	968,380	384,544	
14	0.3677	-	681,360	681,360	250,536	-	581,420	414,960	996,380	366,369	
15	0.3405	-	681,360	681,360	232,003	-	581,420	456,960	1,038,380	353,568	
16	0.3152	-	681,360	681,360	214,765	-	581,420	770,940	1,352,360	426,264	
17	0.2919	-	681,360	681,360	198,889	-	581,420	1,493,310	2,074,730	605,614	
18	0.2703	-	681,360	681,360	184,172	-	581,420	400,960	982,380	265,537	
19	0.2502	-	681,360	681,360	170,476	-	581,420	587,060	1,168,480	292,354	
20	0.2317	-	681,360	681,360	157,871	-	581,420	456,696	1,038,116	240,531	
21	0.2145	-	681,360	681,360	146,152	-	581,420	515,010	1,096,430	235,184	
22	0.1987	-	681,360	681,360	135,386	-	581,420	414,960	996,380	197,981	
23	0.1839	-	681,360	681,360	125,302	-	581,420	386,960	968,380	178,085	
24	0.1703	-	681,360	681,360	116,036	-	581,420	400,960	982,380	167,299	
25	0.1577	-	681,360	681,360	107,450	-	581,420	386,960	968,380	152,714	
26	0.1460	-	681,360	681,360	99,479	-	581,420	414,960	996,380	145,471	
27	0.1352	-	681,360	681,360	92,120	-	581,420	456,960	1,038,116	140,353	
28	0.1252	-	681,360	681,360	85,306	-	581,420	414,960	996,380	124,747	
29	0.1159	-	681,360	681,360	78,970	-	581,420	742,940	1,324,360	153,493	
30	0.1073	-	681,360	681,360	73,110	-	581,420	1,477,310	2,058,730	220,902	
31	0.0994	-	681,360	681,360	67,727	-	581,420	356,960	938,380	93,275	
32	0.0920	-	681,360	681,360	62,685	-	581,420	-888,590	-307,170	-28,260	
Total						13,854,168	Total	14,156,405			



The cost for the alternative plan should be considered as a benefit for the basic plan.

It means that a profitability of a project is calculated as a sum of a balance of costs of basic plan and alternative, and a direct benefit of the basic plan.

In concrete, the sum of cost for Berth-B and the expected direct benefit from Berth-A is defined as the benefit of Berth-A and the sum is compared to the cost of Berth-A. The benefit from the berth is different for P. T. Semen Nusantara and for the regional economy, so the economical evaluation is carried out separately for both parties.

The calculation is carried out in a manner that the cost and benefit is calculated individually for assumed economical life of the proposed berth (20 years) and the annual amounts are discounted to the present value.

7-4 Profitability for P. T. Semen Nusantara (Case - 0)

Physical life of the berth is estimated to be 30 years, however, economical life will be around 20 years because of berthing of big vessels and special type vessels, so 20 years is used as the life of the berth in this study.

The cost and benefit for P. T. Semen Nusantara are as shown in Table 7-8 during the economical life of 20 years.

And, the accumulated present value of the base plan, that is a balance of accumulated cost and benefit, is (-)1,212,930 thousand rupiah as shown in Table 7-7.

The cost benefit ratio (B/C ratio) is 0.89 and internal return ratio (I.R.R.) is 6.89% for P. T. Semen Nusantara.

Thus, profitability of the project is low for P. T. Semen Nusantara,

so this project will be unfeasible in case it is realised by commercial financing.

**Table 7-7 Economical Index of the Project
(For P. T. Semen Nusantara)**

N.P.V. (deducted by 12%)	B/C ratio	I.R.R.
Rp. 1,212,930,000	0.89	6.89

N.P.V. : Net present value
 B/C ratio: Cost benefit ratio
 I.R.R. : Internal return ratio

7-4-1 Basis and Process of Calculation of Economical Indexes

Process of the calculation of the economical indexes is presented hereinafter, and the calculated items are as below;

Conception of Comparison

Cost of Berth-A (C)	Benefit of Berth-A (B)
1. Construction cost of Berth-A	1. Construction cost of Berth-B
2. Maintenance and operation cost of Berth-A	2. Maintenance and operation cost of Berth-B
	3. Transportation cost of cement from plant to Berth-B
	4. Construction cost of cement transportation facility (locomotive and wagon)

7-4-2 Benefit of Berth-A

Costs for Berth-B are considered as benefit for Berth-A in this comparison.

The costs for Berth-B are categorized into construction costs of the Berth-B and the relevant facilities, maintenance and operation cost, and cost of cement transportation from the cement plant to Berth-B.

(a) Construction, Maintenance and Operation Cost of Berth-B

The construction cost presented in Table 7-3 was calculated in the same manner as Berth-A on a present price basis (September 1980). And the basic price was adjusted by the physical contingency and price contingency with same rates as for Berth-A.

The estimated total construction cost for Berth-B is 826,430 thousand yen, and the amount of the maintenance and operation cost is 200,490 thousand yen per year as shown in Table 7-4.

(b) Transportation Cost of Cement and Relevant Material

In case of Berth-B, cement and relevant material consumed in the cement factory have to be transported between the cement factory and Berth-B.

The quantity of cargo and the transportation cost are as shown in Table 7-9, 7-10, and 7-11.

Table 7-8 Cost and Benefit for Berth-A
(For P.T. Semen Nusantara)

(Unit: Rp 1,000)

Year	Cost of Berth-A			Benefit for Berth-A		
	① Capital cost	② Maintenance/Operation cost	③ Total cost	④ Construction cost of Berth-B	⑤ Inland transp. cost (T ₁ + T ₂)	⑥ Total benefit ④ + ⑤
1	2,367,580	-	2,367,580	798,880	-	798,880
2	4,735,170	-	4,735,170	1,597,710	-	1,597,710
3	-	681,360	681,360	581,420	540,700	1,122,120
4	-	"	"	"	1,444,320	2,025,740
5	-	"	"	"	309,970	891,390
6	-	"	"	"	565,070	1,146,490
7	-	"	"	"	350,970	932,390
8	-	"	"	"	515,010	1,096,430
9	-	"	"	"	456,960	1,038,380
10	-	"	"	"	414,960	996,380
11	-	"	"	"	386,960	968,380
12	-	"	"	"	400,960	982,380
13	-	"	"	"	386,960	968,380
14	-	"	"	"	414,960	996,380
15	-	"	"	"	456,960	1,038,380
16	-	"	"	"	770,940	1,352,360
17	-	"	"	"	1,493,310	2,074,730
18	-	"	"	"	400,960	982,380
19	-	"	"	"	587,060	1,168,480
20	-	"	"	"	456,696	1,038,380
21	-	"	"	"	515,010	1,096,430
22	-	"	"	"	-643,750	-62,330

Note: The capital cost is divided into two parts with a ratio of 1 : 2 for 1981 and 1982, as the construction period is supposed from June 1981 to the end of 1982.

As to T₁ + T₂, please refer to Table 7-10 and Table 7-11.

Table 7-9 Inland Transportation Cost for Cargo
of P. T. Semen Nusantara

(Unit: 1,000 T/year)

Year	Railway				Truck Gypsum paper	Total
	Bulk	Clinker	Bagged	Total		
1						
2						
3	-	-	101	101	33	134
4	300	250	60	601	46	656
5	"	"	"	"	"	"
6	330	350	40	720	56	776
7	"	"	"	"	"	"
8	400	"	30	780	69	849
9	"	"	"	"	"	"
10	"	"	"	"	"	"
11	"	"	"	"	"	"
12	"	"	"	"	"	"
13	"	"	"	"	"	"
14	"	"	"	"	"	"
15	"	"	"	"	"	"
16	"	"	"	"	"	"
17	"	"	"	"	"	"
18	"	"	"	"	"	"
19	"	"	"	"	"	"
20	"	"	"	"	"	"
21	"	"	"	"	"	"
22	"	"	"	"	"	"

Table 7-10 Transportation Cost of Cement from Factory to Berth-B

(Unit: Rp 1,000)

Year	Locomotive		wagon		Operation cost Fuel/Labor	Maintenance rail	Total (Ti)
	Q'ty	Cost	Q'ty	Cost			
1981	-	-	-	-	-	-	-
1982	-	-	-	-	-	-	-
1983	1	155,875	4	200,100	25,250	42,000	423,225
1984	1	155,875	19	950,475	152,500	91,000	1,349,850
1985	0	0	0	0	"	"	243,500
1986	0	0	4	200,100	180,000	95,000	475,100
1987	0	0	0	0	"	"	275,000
1988	0	0	2	100,050	195,000	97,000	392,050
1989	0	0	0	0	"	"	292,000
1990	0	0	0	0	"	"	"
1991	0	0	0	0	"	"	"
1992	0	0	0	0	"	"	"
1993	0	0	0	0	"	"	"
1994	0	0	0	0	"	"	"
1995	0	0	0	0	"	"	"
1996	1	155,875	4	200,100	"	"	647,980
1997	1	155,875	19	950,475	"	"	1,398,350
1998	0	0	0	0	"	"	292,000
1999	0	0	4	200,100	"	"	492,100
2000	0	0	0	0	"	"	292,000
2001	0	0	2	100,050	"	"	392,050
2002		-158,560		-827,340	"	"	-693,910

Note: Remaining value of locomotive and wagon in Table 9-10

$$\text{Locomotive, } 155,855 \times \left(\frac{7}{13} + \frac{6}{13} \right) = 158,560 \text{ (Rp 1,000)}$$

$$\begin{aligned} \text{Wagon, } 50,025 \times \left(\frac{6}{13} \times 4 + \frac{7}{13} \times 19 + \frac{9}{13} \times 4 + \frac{11}{13} \times 2 \right) \\ = 827,340 \text{ (Rp 1,000) (Depreciation: 13 years)} \end{aligned}$$

Table 7-11 Transportation Cost by Truck from Cement Factory to Public Port
(Unit: Rp 1,000)

Year	Truck (8 t)	Operation cost	Labor cost	Total (T ₂)
3	70,000	35,780	11,700	117,480
4	28,000	50,090	16,380	94,470
5	0	"	"	66,470
6	14,000	57,250	18,720	89,970
7	0	71,560	"	75,970
8	28,000	"	23,400	122,960
9	70,000	"	"	164,960
10	28,000	"	"	122,960
11	0	"	"	94,960
12	14,000	"	"	108,960
13	0	"	"	94,960
14	28,000	"	"	122,960
15	70,000	"	"	164,960
16	28,000	"	"	122,960
17	0	"	"	94,960
18	14,000	"	"	108,960
19	0	"	"	94,960
20	70,000	"	"	164,960
21	28,000	"	"	122,960
22	-44,800	"	"	50,160

Note: Remaining value of truck (8 t)

$$70,000 \times \frac{2}{5} + 28,000 \times \frac{3}{5} = 44,800 \text{ (Rp 1,000)}$$

7-5 Profitability for Regional Economy (Case 1 - Case 9)

The profitability for regional economy is extremely high comparing to that for the projector as shown in Table 7-12.

This is attributed to the followings;

- (1) Inland transportation cost can be saved by the establishment of Berth-A.
- (2) Demurrage cost can be saved by increase of berthing capacity in Cilacap area.
- (3) Berthing charges enter into the port authorities not into the projector.

Thus the benefit of Berth-A for regional economy is very high.

Table 7-12 Economical Indexes for Regional Economy
(Case 1)

N.V.P.	B/C ratio	I.R.R.
Rp 2,081,660,000	1.20	20.49

7-5-1 Basis and Process of Calculation of Economical Indexes

Basis of calculation of the economical indexes presented in Table 7-12 is hereinafter described and items calculated for the profitability evaluation are as follows;

Conception of Comparison

Cost of Berth-A	Benefit of Berth-A
(1) Construction cost of Berth-A	(1) Construction cost of Berth-B
(2) Maintenance and operation cost of Berth-A	(2) Maintenance and operation cost of Berth-B
	(3) Benefit from decrease of demurrage cost
	(4) Benefit from saving inland transportation
▲ Adjustment of transfer income	

7-5-2 Benefit of Berth-A

From the standpoint of regional economy, the benefits of Berth-A are construction cost of Berth-B, maintenance and operation cost of Berth-B, cost saved by demurrage decrease and cost for inland transportation of the cargo to be shipped on Berth-B.

(a) Construction cost and maintenance and operation cost.

This is same as mentioned in Section 7-1 as to P. T. Semen Nusantara.

(b) Benefit from decrease of demurrage cost.

As presented in Chapter 4, cargo of 750,000 tons was handled in 1979 in the public port of Cilacap, and it exceeded the capacity of 350,000 tons per year that is considered normal for the scale of the Cilacap port. So, even though cargo is handled sometimes throughout the night, demurrage is observed. (Refer to Fig. 4-8.) Furthermore, demand of port usage is

increasing by a rate of about 25% annually, and further increase of demurrage is foreseen in the future.

When Berth-A is constructed, the cargo of P. T. Semen Nusantara handled in the public port, of which quantity is about 200,000 tons in 1979, and general cargo which can be handled in Berth-A, will be shifted to Berth-A. This is equivalent to an expansion of 250,000 tons per annum capacity in the public port, therefore, decrease of demurrage can be expected. Assumption basis of demurrage decrease is 250,000 tons per annum for cargo quantity and 3 days berthing per ship.

The cost for demurrage is estimated by average value collected from Indonesian shipping companies; that is, Rp.1,220,000/day for 5,000 tons DWT vessel and Rp. 3,050,000/day for 10,000 DWT vessel.

Benefits from decreasing of demurrage calculated by these unit cost are Rp. 268,780,000 in 1983 and Rp. 334,310,000 for every year in and from 1984 as shown Table 7-13.

(c) Benefit from Transportation Cost from Berth-A to Berth-B

By using Berth-A, cost for transportation of general cargo from Berth-A to the public berth, herein the products of the pulp factory with a quantity of 50,000 tons per annum is expected, can be saved, and is a benefit to Berth-A. (Refer to Table 7-19.)

7-5-3 Adjustment of Transfer Income

The figures presented in Table 7-12 include taxes which are sorts of transfer income to the government.

So, such amount of transfer income should be reduced from the apparent saving amount, and it is Rp. 622,250,000 for the case of the Berth-A as calculated in Chapter 8. As for the case of Berth-B, the

construction, maintenance and operation cost are also adjusted by the transfer income.

7-5-4 Other Adjustments

In the basic cost of this project, Rp. 174,000,000 is for labor cost and about 50% of the amount is expected to be for unskilled labor. However, unemployment ratio in Cilacap area is more than 20% and the estimated amount of labor cost exceeds the opportunity cost of labor.

Therefore, the exceeding portion should be reduced from the apparent total cost of the project.

For the adjustment, an opportunity cost calculated by WORLD BANK for Indonesia, that is 62% of market labor cost, is adopted.

Table 7-13 Cost and Benefit for Berth-A
(For regional economy)

(Unit: Rp 1,000)

Year	Cost C		Benefit B		
	① Berth-A	② Berth-B	③ Inland transportation cost (T ₁ +T ₂ +T ₃)	④ Demurrage saving cost	Total benefit ②+③+④
1	2,367,580	798,880	-	-	798,880
2	4,735,170	1,597,770	-	-	1,597,770
3	681,360	581,420	803,170	268,780	1,653,370
4	"	"	1,628,200	334,310	2,543,930
5	"	"	423,930	"	1,239,660
6	"	"	660,030	"	1,475,760
7	"	"	445,930	"	1,261,660
8	"	"	609,480	"	1,425,210
9	"	"	593,430	"	1,409,160
10	"	"	481,430	"	1,297,160
11	"	"	453,430	"	1,269,160
12	"	"	467,430	"	1,283,160
13	"	"	481,430	"	1,297,160
14	"	"	551,430	"	1,367,160
15	"	"	523,430	"	1,339,160
16	"	"	837,410	"	1,653,140
17	"	"	1,559,780	"	2,375,510
18	"	"	495,430	"	1,311,160
19	"	"	723,530	"	1,539,260
20	"	"	523,430	"	1,339,160
21	"	"	581,480	"	1,397,210
22	"	"	-577,280	"	238,450

Note: As to T₁, T₂, and T₃, please refer to Table 9-10, 9-11, and 9-19.

Table 7-14 Cost and Benefit for Berth-A adjusted by transfer incomes
(For regional economy)

(Unit: Rp 1,000)

Year	Cost C		Benefit B		
	① Berth-A Total cost	② Berth-B Total cost	③ Inland transportation cost (T ₁ +T ₂ +T ₃)	④ Demurrage saving cost	Total benefit ②+③+④
1	2,083,560	693,220	-	-	693,220
2	4,167,130	1,386,430	-	-	1,386,430
3	647,290	552,350	763,010	268,780	1,584,140
4	"	"	1,546,790	334,310	2,433,450
5	"	"	402,730	"	1,289,390
6	"	"	627,030	"	1,513,690
7	"	"	423,630	"	1,310,290
8	"	"	579,010	"	1,465,670
9	"	"	563,760	"	1,450,420
10	"	"	457,360	"	1,344,020
11	"	"	430,760	"	1,317,420
12	"	"	444,060	"	1,330,720
13	"	"	457,360	"	1,344,020
14	"	"	523,860	"	1,410,520
15	"	"	497,260	"	1,383,920
16	"	"	793,640	"	1,680,300
17	"	"	1,481,790	"	2,368,450
18	"	"	470,660	"	1,357,320
19	"	"	687,350	"	1,574,010
20	"	"	497,260	"	1,383,920
21	"	"	552,410	"	1,439,070
22	"	"	-548,420	"	338,420

Table 7-15 Port Charges In Cilacap Port

A. Anchorage Fee

	Charge per G.W.T.	
	Rp	or US\$
1. Foreign vessel	40.4	0.065
2. Domestic vessel	20.4	-

B. Berthing Fee

		Charge
1. Foreign vessel	a. per ship	Rp 19,652.5 or US\$ 31.30
	b. and per G.W.T.	Rp 6.75 or US\$ 0.011
2. Domestic vessel	a. per ship	Rp 13,000
	b. and per G.W.T.	Rp 4.5

Table 7-16 Proposed Number of Vessels to Berth-A

	1983	1984	1985	1986	1987	In/after 1988
Cement vessel						
4,000 G.W.T.	8	27	27	25	25	30
10,000 G.W.T.	5	24	24	30	30	31
15,000 G.W.T.	1	18	18	23	23	25
Material for cement						
8,000 G.W.T.	9	11	11	13	13	16
General cargo						
5,000 G.W.T.	10	16	16	13	13	10
Total	33	96	96	104	104	112

Table 7-17 Estimation of Berthing Charge

(Unit: Rp 1,000)

Year	For P.T. Semen Nusantara's Cargo						Bypass, Paper vessel		For General cargo 5,000 DWT		Total (F)	$\frac{F}{(I+F)E}$
	5,000 DWT vessel		10,000 DWT vessel		15,000 DWT vessel		A	B	A	B		
	A	B	A	B	A	B	A	B	A	B		
1981												
1982												
1983	800	280	1,000	290	300	80	2,900	550	1,500	660	8,160	6,690
1984	2,700	960	4,800	1,390	5,400	1,450	3,520	670	2,400	700	23,990	17,080
1985	2,700	960	4,800	1,390	5,400	1,450	3,520	670	2,400	700	23,990	15,250
1986	2,500	890	5,000	1,740	6,900	1,850	3,760	790	1,950	570	27,950	14,860
1987	2,500	890	5,000	1,740	6,900	1,850	5,760	790	1,950	570	27,950	14,160
1988	3,000	1,070	6,200	1,800	7,500	2,010	5,120	970	1,500	460	29,610	13,990
1989	"	"	"	"	"	"	"	"	"	"	"	11,960
1990	"	"	"	"	"	"	"	"	"	"	"	10,680
1991	"	"	"	"	"	"	"	"	"	"	"	9,530
1992	"	"	"	"	"	"	"	"	"	"	"	8,510
1993	"	"	"	"	"	"	"	"	"	"	"	7,600
1994	"	"	"	"	"	"	"	"	"	"	"	6,790
1995	"	"	"	"	"	"	"	"	"	"	"	6,060
1996	"	"	"	"	"	"	"	"	"	"	"	5,610
1997	"	"	"	"	"	"	"	"	"	"	"	4,830
1998	"	"	"	"	"	"	"	"	"	"	"	4,310
1999	"	"	"	"	"	"	"	"	"	"	"	3,850
2000	"	"	"	"	"	"	"	"	"	"	"	3,460
2001	"	"	"	"	"	"	"	"	"	"	"	3,070
2002	"	"	"	"	"	"	"	"	"	"	"	2,740
											Total	170,010

Note: A = Anchorage Fee, B = Berthing Fee, F = reduction ratio, A = year

Table 7-18 Cost Saved by Decrease of Demurrage caused by
Establishment of Berth-A

(Unit: Rp 1,000)

Year	Demurrage decrease (Days)	Daily cost for demurrage	Fuel cost	Total
1	-	-	-	-
2	-	-	-	-
3	123	523,980	13,530	268,780
4	153	651,780	16,830	334,310
5	"	"	"	"
6	"	"	"	"
7	"	"	"	"
8	"	"	"	"
9	"	"	"	"
10	"	"	"	"
11	"	"	"	"
12	"	"	"	"
13	"	"	"	"
14	"	"	"	"
15	"	"	"	"
16	"	"	"	"
17	"	"	"	"
18	"	"	"	"
19	"	"	"	"
20	"	"	"	"
21	"	"	"	"
22	"	"	"	"

Table 7-19 Truck Transportation Cost of General Cargo from Berth-A to Public Port

(Unit: Rp 1,000)

Year	Pulp (1,000 t)	Other (1,000 t)	Total (1,000 t)	Q'ty of truck	Q'ty of (8 t)	Truck cost	Operation cost	Labor cost	Total (Rp)
1	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	-	50	50	7	7	98,000	50,090	16,380	262,470
4	50	30	80	12	5	70,000	85,880	28,080	183,880
5	"	30	80	12	-	0	"	"	113,560
6	"	15	65	10	-	"	71,560	23,400	94,960
7	"	15	65	10	-	"	"	"	"
8	"	0	50	7	2	28,000	50,090	16,380	94,470
9	"	"	"	"	5	70,000	"	"	136,470
10	"	"	"	"	-	-	"	"	66,470
11	"	"	"	"	-	-	"	"	"
12	"	"	"	"	-	-	"	"	"
13	"	"	"	"	2	28,000	"	"	94,470
14	"	"	"	"	5	70,000	"	"	136,470
15	"	"	"	"	-	-	"	"	66,470
16	"	"	"	"	-	-	"	"	"
17	"	"	"	"	-	-	"	"	"
18	"	"	"	"	2	28,000	"	"	94,470
19	"	"	"	"	5	70,000	"	"	136,470
20	"	"	"	"	-	-	"	"	66,470
21	"	"	"	"	-	-	"	"	"
22	"	"	"	"	-	-	"	"	"

7-6 Sensibility Analysis

Sensibility analysis on the economical indexes such as I.R.R., N.P.V. and B/C ratio is carried out changing the construction cost, quantity of cargo handled in the new berth and demurrage which are important factors for the project.

The result is summarized in Table 7-20.

7-6-1 Effect of Construction Cost

Effect of fluctuation of construction cost is rather sharp, that is, I.R.R. changes about 19% by fluctuation of 10% in the construction cost.

Eventhough the I.R.R. is 16.67% for increase of 10% in the construction cost, it can be said that this project is still feasible.

7-6-2 Effect on Quantity of Cargo

I.R.R. changes about 10% by a fluctuation of 50% of the quantity of cargo handled on the new berth, so it can be said that the fluctuation of the quantity does not greatly effect the regional profitability of the project.

Even in an extreme case, where, the general cargo quantity shipped on the new berth is zero, I.R.R. is 17.25% and the project is still profitable (Case-6).

7-6-3 Effect of Demurrage

Changes of I.R.R., N.P.V. and B/C ratio are not sharp for fluctuation of demurrage. I.R.R. changes approximately 4% proportioning to fluctuation of 10% in demurrage hour.

As an extreme case when decrease of demurrage is not expected, I.R.R. is 11.53%, and in this case I.R.R. is lower than the capital opportunity

ratio of 124 in Indonesia, the project is not feasible.

However, this case is not realistic because effect on decrease of demurrage is surely expected from shifting the cement shipping, that was 200,000 tons in 1979, from public port to the new berth.

As a conclusion, it can be said that the expected fluctuations on the major economical elements do not affect the feasibility of the project.

Table 7-20 Summary of Sensibility Analysis

Case	N.P.V. (Rp 1,000) (Deduction ratio 12% year)	B/C ratio	I.R.R. (%)
(1) Case-0 (For P.T.SN) Profitability for P.T.SN	- 1,212,930	0.89	6.89
(2) Case-1 (Basic case) Profitability for region	2,081,660	1.21	20.49
(3) Case-2 Construction cost 10% up	1,692,360	1.16	(-18.6%) 16.67
(4) Case-3 Construction cost 10% down	2,557,990	1.26	(+18.9%) 24.37
(5) Case-4 General cargo 50% up	2,519,270	1.25	(+11.0%) 22.34
(6) Case-5 General cargo 50% down	1,662,650	1.16	(- 6.8%) 18.76
(7) Case-6 General cargo 100% down	1,303,140	1.13	(-15.8%) 17.26
(8) Case-7 Demurrage 10% up	2,300,400	1.23	(+ 4.0%) 21.30
(9) Case-8 Demurrage 10% down	1,863,940	1.18	(- 4.0%) 19.68
(10) Case-9 Demurrage 100% down	-101,730	0.99	(-43.7%) 11.53

Note: Figures in () are deviations from Basic case.

7-7 Other Benefits

Other direct benefits of the project which cannot be quantitatively measured are (1) a scale merit of using big vessels, and (2) value increase of the industrial estate located in the west part of Cilacap peninsula which faces the proposed channel.

As indirect benefits, (1) increase of local employment, (2) increase of income by employment of local labor, and (3) relief of traffic in town, are expected.

7-7-1 Scale Merit of Using Big Vessels

For shipping of cement, small ocean going vessels with a capacity of 3,000 - 5,000 tons DWT are now used.

Owing to the establishment of the new berth, big vessels upto 15,000 tons DWT can be accessible to the cement plant, and it comes to reduction of sea transportation cost. This benefit is distributed to cement consumers, shipping companies and the cement manufacturer.

7-7-2 Value Increase of Industrial Estate

By the opening of channel in the Donan River along the existing industrial estate, the development of the area will be accelerated owing to accessibility of big vessels to the area.

PERTAMINA intends to switch the shipping of asphalt from 3,000 tons DWT vessel to bigger vessels.

7-7-3 Promotion of Local Employment and Income

Average of local employment for this project is estimated to be 200 - 300 persons during the construction period which is presumed to be 18 months. And increased employment of the cement factory, that is

estimated to be approximately 500 persons, is a benefit of the project, because the expansion of the cement factory cannot be considered without the establishment of the new berth.

In addition to that, establishment of the proposed pulp factory and other factories will be motivated by the opening of the channel. And increase of employment in those factories can be considered a part of the project benefit though it is indirect.

Furthermore, a part of the income of those proposed factories might be an effect from the new berth project.

Considering the facts that unemployment in Cilacap is rather high as about 20%, and that "income per capita" is about Rp. 50,000 per year (it is about 1/3 to national average income per capita), increase of employment and income comports to the aim of PELITA-III that aims to the locally balanced development.

A. Input Data

Table 7-21, Case-2; Construction Cost: 10% up

(Unit: Rp 10,000)

Year	Cost C		Benefit B		
	① Berth-A Total cost	② Berth-B Total cost	③ Inland transport- cost (T ₁ +T ₂ +T ₃)x95%	④ Benefit from demur- rage decrease	Total benefit ② + ③ + ④
1	229,192	76,255	-	-	76,255
2	458,384	152,507	-	-	152,507
3	64,734	55,235	76,301	26,878	158,414
4	"	"	154,679	33,431	188,110
5	"	"	40,273	"	128,939
6	"	"	62,703	"	151,369
7	"	"	42,363	"	131,029
8	"	"	57,901	"	146,567
9	"	"	56,376	"	145,042
10	"	"	45,736	"	134,402
11	"	"	43,076	"	131,742
12	"	"	44,406	"	133,072
13	"	"	45,736	"	134,402
14	"	"	52,386	"	141,052
15	"	"	49,726	"	138,392
16	"	"	79,364	"	168,030
17	"	"	148,179	"	236,845
18	"	"	47,066	"	135,732
19	"	"	68,735	"	157,401
20	"	"	49,726	"	138,392
21	"	"	55,241	"	143,907
22	"	"	-54,842	"	-33,824

Note: Construction costs are increased by 10% for 1st and 2nd year.

Table 7-22, Case-3; Construction Cost: 10% down

(Unit: Rp 10,000)

Year	Cost C		Benefit B		
	① Berth-A Total cost	② Berth-B Total cost	③ Inland transport- cost (T ₁ +T ₂ +T ₃)x95%	④ Benefit from demur- rage decrease	Total benefit ②+③+④
1	187,520	62,390	-	-	62,390
2	375,042	124,799	-	-	124,799
3	64,734	55,235	76,301	26,878	158,414
4	"	"	154,679	33,431	188,110
5	"	"	40,273	"	128,939
6	"	"	62,703	"	151,369
7	"	"	42,363	"	131,029
8	"	"	57,901	"	146,567
9	"	"	56,376	"	145,042
10	"	"	45,736	"	134,402
11	"	"	43,076	"	131,742
12	"	"	44,406	"	133,072
13	"	"	45,736	"	134,402
14	"	"	52,386	"	141,052
15	"	"	49,726	"	138,392
16	"	"	79,364	"	168,030
17	"	"	148,179	"	236,845
18	"	"	47,066	"	135,732
19	"	"	68,735	"	157,401
20	"	"	49,726	"	138,392
21	"	"	55,241	"	143,907
22	"	"	-54,842	"	-33,824

Note: Construction costs are decreased by 10% for 1st and 2nd year.

Table 7-23, Case-4; General Cargo: 50 up

(Unit: Rp 10,000)

Year	Cost C		Benefit B		
	① Berth-A Total cost	② Berth-B Total cost	③ Inland transport- cost (T ₁ +T ₂ +T ₃)×95%	④ Benefit from demur- rage decrease	Total benefit ②+③+④
1	208,356	69,322			69,322
2	416,713	138,643			138,643
3	64,734	55,235	89,425	26,878	171,538
4	"	"	163,873	33,431	252,539
5	"	"	49,971	"	138,637
6	"	"	67,451	"	156,117
7	"	"	47,111	"	135,777
8	"	"	62,625	"	151,291
9	"	"	63,200	"	151,866
10	"	"	49,060	"	137,726
11	"	"	46,400	"	135,066
12	"	"	47,730	"	136,396
13	"	"	50,460	"	139,126
14	"	"	59,210	"	147,876
15	"	"	53,050	"	141,716
16	"	"	82,688	"	171,354
17	"	"	151,503	"	240,169
18	"	"	51,790	"	140,456
19	"	"	75,559	"	164,225
20	"	"	53,050	"	141,716
21	"	"	58,565	"	147,231
22	"	"	-42,956	"	45,710

Item	Description	Quantity	Unit	Price	Total
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Table 7-24, Case-5: General Cargo: SCL down

(Unit: Rp 10,000)

Year	Cost-C		Benefit B		
	① Berth-A Total cost	② Berth-B Total cost	③ Inland transport- cost (T ₁ +T ₂ +T ₃)×95%	④ Benefit from demur- rage decrease	Total Benefit ② + ③ + ④
1	208,356	69,322			69,322
2	416,713	138,643			138,643
3	64,734	55,235	63,178	26,878	145,231
4	"	"	145,485	33,431	234,151
5	"	"	34,575	"	123,241
6	"	"	57,955	"	146,621
7	"	"	37,615	"	126,281
8	"	"	53,178	"	141,814
9	"	"	49,553	"	138,219
10	"	"	42,413	"	131,079
11	"	"	39,753	"	128,419
12	"	"	41,083	"	129,749
13	"	"	41,013	"	129,679
14	"	"	45,563	"	134,229
15	"	"	46,403	"	135,069
16	"	"	76,041	"	164,707
17	"	"	144,856	"	233,522
18	"	"	39,019	"	127,685
19	"	"	61,912	"	150,578
20	"	"	43,079	"	131,745
21	"	"	51,918	"	140,584
22	"	"	-50,433	"	38,233

Table 7-25, Case-6; General Cargo: 100% down

(Unit: Rp 10,000)

Year	Cost C		Benefit B		
	① Berth-A Total cost	② Berth-B Total cost	③ Inland transport- cost (T ₁ +T ₂ +T ₃)x95%	④ Benefit from demur- rage decrease	Total benefit ②+③+④
1	208,356	69,322			69,322
2	416,713	138,643			138,643
3	64,734	55,235	51,366	26,878	133,479
4	"	"	137,210	33,431	225,876
5	"	"	29,447	"	118,113
6	"	"	53,682	"	142,348
7	"	"	33,342	"	122,008
8	"	"	48,926	"	137,592
9	"	"	43,411	"	132,077
10	"	"	39,421	"	128,087
11	"	"	36,761	"	125,457
12	"	"	38,091	"	126,757
13	"	"	36,761	"	125,427
14	"	"	39,421	"	128,087
15	"	"	43,411	"	132,077
16	"	"	73,239	"	161,905
17	"	"	141,864	"	230,530
18	"	"	38,091	"	126,757
19	"	"	55,771	"	144,437
20	"	"	43,411	"	132,077
21	"	"	48,926	"	137,592
22	"	"	-52,925	"	35,741

Table 7-26, Case-7; Demurrage: 10% up

(Unit: Rp 10,000)

Year	Cost C	Benefit B			
	① Berth-A Total cost	② Berth-B Total cost	③ Inland transport- cost ($T_1+T_2+T_3$)x95%	④ Benefit from demur- rage decrease	Total benefit ②+③+④
1	208,356	69,322			69,322
2	416,713	138,643			138,643
3	64,734	55,235	76,301	29,566	161,102
4	"	"	154,679	36,774	246,688
5	"	"	40,273	"	133,222
6	"	"	62,703	"	154,712
7	"	"	42,363	"	134,319
8	"	"	57,901	"	149,910
9	"	"	56,376	"	148,385
10	"	"	45,736	"	137,745
11	"	"	43,076	"	135,085
12	"	"	44,406	"	136,415
13	"	"	45,736	"	134,774
14	"	"	52,386	"	144,393
15	"	"	49,726	"	141,735
16	"	"	79,364	"	171,373
17	"	"	148,179	"	240,188
18	"	"	47,066	"	139,075
19	"	"	68,735	"	160,744
20	"	"	49,726	"	147,250
21	"	"	55,241	"	143,907
22	"	"	-54,842	"	37,167

Table 7-27, Case-8; Demurrage Decrease: 10%

(Unit: 8p 10,000)

Year	Cost C		Benefit B		
	① Berth-A Total cost	② Berth-B Total cost	③ Inland transport- cost ($T_1+T_2+T_3$)x95%	④ Benefit from demurrage decrease	Total benefit ②+③+④
1	208,356	69,322			69,322
2	416,713	138,643			138,643
3	64,734	55,235	76,301	24,190	155,726
4	"	"	154,679	30,088	240,002
5	"	"	40,273	"	125,596
6	"	"	62,703	"	148,026
7	"	"	42,363	"	127,686
8	"	"	57,901	"	143,224
9	"	"	56,376	"	141,699
10	"	"	45,736	"	131,059
11	"	"	43,076	"	128,399
12	"	"	44,406	"	129,729
13	"	"	45,736	"	131,059
14	"	"	52,386	"	137,709
15	"	"	49,726	"	135,049
16	"	"	79,364	"	164,687
17	"	"	148,179	"	233,502
18	"	"	47,066	"	132,389
19	"	"	68,735	"	154,058
20	"	"	49,726	"	135,049
21	"	"	55,241	"	140,564
22	"	"	-54,842	"	30,481

Table 7-28, Case-9; Demurrage Decrease: Zero

(Unit: Rp 10,000)

Year	Cost C	Benefit B			
	① Berth-A Total cost	② Berth-B Total cost	③ Inland transport- cost ($T_1+T_2+T_3$)x95%	④ Benefit from demurrage decrease	Total benefit ②+③+④
1	208,356	69,322			69,322
2	416,713	138,643			138,643
3	64,734	55,235	76,301	0	131,536
4	"	"	154,679	"	209,914
5	"	"	40,273	"	95,508
6	"	"	62,703	"	117,938
7	"	"	42,363	"	97,598
8	"	"	57,901	"	113,136
9	"	"	56,376	"	111,611
10	"	"	45,736	"	100,971
11	"	"	43,076	"	98,311
12	"	"	44,406	"	99,641
13	"	"	45,736	"	100,971
14	"	"	52,386	"	107,621
15	"	"	49,726	"	104,961
16	"	"	79,364	"	134,599
17	"	"	148,179	"	203,414
18	"	"	47,066	"	102,301
19	"	"	68,735	"	123,970
20	"	"	49,726	"	104,961
21	"	"	55,241	"	110,476
22	"	"	-54,842	"	393

7-8 Conclusion

As to the socio-economical effect of the project, the JICA Team came to the following conclusion.

- (1) Feasibility of the expansion of the cement factory is not examined in this study because it is to be decided by P.T. Semen Nusantara.
- (2) For the expansion of the cement factory, additional berth is required for shipping of products, as the public berth is crowded to cause demurrage.
- (3) As to location for new berth, P.T. Semen Nusantara has selected two places in its previous study, i.e., the southern adjacent area of the cement factory (Berth-A) and the adjacent area of the existing private berth of P.T. Semen Nusantara located in the public port area (Berth-B).

The JICA Team conceived, as a result of its site survey in Cilacap area, that the selection of P.T. Semen Nusantara is reasonable, and decided the best place studying from (a) technical view, (b) economical view and (c) public view.

a) Comparison from technical view

There is no problem in construction of the both berthes and in dredging of the sea route.

In case of Berth-B, inland transportation of cargo between Berth-B and cement plant is needed, but the capacity of the railway is insufficient.

So, Berth-A plan is more reliable than Berth-B plan.

b) Comparison from economical view

Although Berth-A is inferior to Berth-B in the cost of construction and maintenance, cost for inland transportation is not required in case of Berth-A.

So, Berth-A is more advantageous in economical view if it is compared in long term.

c) Comparison from public interest

As the location of Berth-A is near to the existing industrial estate, it is convenient for general cargo to be shipped through Berth-A.

And the establishment of the sea route in the Donan River will enable an access of bigger ocean going vessel to the industrial area located in the western part of the Cilacap town, so the development of the area will be promoted.

Thus the location of Berth-A is advantageous from a socio-economical view as well as from the standpoint of P.T. Semen Nusantara.

- (5) This project is indispensable for the expansion of the cement factory of P.T. Semen Nusantara, however it is unfeasible for P.T. Semen Nusantara, since I.R.R. is 6.89%.

From a view point of regional economy, the profitability of the project is rather high, i.e. I.R.R. is 20.49%, even the profitability is evaluated only with quantifiable economical factors.

When the profitability counts for unquantifiable economical factors, the contribution of the project to the regional economy may be extremely high.

(6) Although this project is indispensable for P.T. Sezen Nusantara, the profitability of the berth itself is low, so that the project will be unfeasible when it depends on a commercial financing.

On the contrary, the project is evaluated very high from the regional economy, so the JICA Team concludes that this project is adequate for the financing of JICA.

APPENDIX

Annex 2 Out-Put Data

CASHFLOW WITH INTEREST RATE 6.892% (Case 0)

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-156870.00	-156870.00	-156870.00	-156870.00
2	-313746.00	-470616.00	-293516.17	-450386.17
3	44077.00	-426539.00	38576.22	-411809.95
4	134439.00	-292100.00	110074.51	-301735.43
5	21004.00	-271096.00	16088.57	-285646.87
6	46514.00	-224582.00	33331.35	-252315.52
7	25104.00	-199478.00	16829.29	-235486.23
8	41508.00	-157970.00	26032.07	-209454.16
9	35703.00	-122267.00	20947.65	-188506.51
10	31503.00	-90764.00	17291.65	-171214.86
11	28703.00	-62061.00	14738.92	-156475.94
12	30103.00	-31958.00	14461.12	-142014.82
13	28703.00	-3255.00	12899.51	-129115.31
14	31503.00	28248.00	13244.99	-115870.32
15	35703.00	63951.00	14042.95	-101827.37
16	67101.00	131052.00	24690.87	-77136.49
17	139338.00	270390.00	47965.71	-29170.78
18	30103.00	300493.00	9694.49	-19476.29
19	48713.00	349206.00	14676.21	-4800.08
20	35703.00	384909.00	10063.00	5262.92
21	41508.00	426417.00	10944.82	16207.73
22	-65704.00	360713.00	-16207.73	0.00

CASHFLOW WITH INTEREST RATE 12.000%

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-156870.00	-156870.00	-156870.00	-156870.00
2	-313746.00	-470616.00	-280130.36	-437000.36
3	44077.00	-426539.00	35137.91	-401862.44
4	134439.00	-292100.00	95691.02	-306171.42
5	21004.00	-271096.00	13348.42	-292823.00
6	46514.00	-224582.00	26393.29	-266429.70
7	25104.00	-199478.00	12718.47	-253711.24
8	41508.00	-157970.00	18776.11	-234935.12
9	35703.00	-122267.00	14419.84	-220515.28
10	31503.00	-90764.00	11360.30	-209154.98
11	28703.00	-62061.00	9241.60	-199913.39
12	30103.00	-31958.00	8653.89	-191259.49
13	28703.00	-3255.00	7367.35	-183892.15
14	31503.00	28248.00	7219.67	-176672.47
15	35703.00	63951.00	7305.54	-169366.93
16	67101.00	131052.00	12259.10	-157107.83
17	139338.00	270390.00	22729.05	-134378.78
18	30103.00	300493.00	4384.33	-129994.45
19	48713.00	349206.00	6334.62	-123659.83
20	35703.00	384909.00	4145.36	-119514.47
21	41508.00	426417.00	4303.00	-115211.47
22	-65704.00	360713.00	-6081.54	-121293.01

CASHFLOW WITH INTEREST RATE 20.488% (Case 1)

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-230786.71	-369820.71
3	93680.00	-323424.00	64529.78	-305290.93
4	178611.00	-144813.00	102112.33	-203178.60
5	64205.00	-80608.00	30464.60	-172714.00
6	86635.00	6027.00	34117.46	-138596.54
7	66295.00	72322.00	21668.10	-116928.44
8	81833.00	154155.00	22198.58	-94729.86
9	80308.00	234463.00	18080.57	-76649.30
10	69668.00	304131.00	13017.97	-63631.32
11	67008.00	371139.00	10391.86	-53239.46
12	68338.00	439477.00	8796.01	-44443.46
13	69668.00	509145.00	7442.40	-37001.05
14	76318.00	585463.00	6766.49	-30234.56
15	73658.00	659121.00	5420.17	-24814.39
16	103296.00	762417.00	6308.61	-18505.78
17	172111.00	934528.00	8723.99	-9781.79
18	70998.00	1005526.00	2986.82	-6794.97
19	92667.00	1098193.00	3235.53	-3559.44
20	73658.00	1171851.00	2134.50	-1424.94
21	79173.00	1251024.00	1904.19	479.25
22	-24009.00	1227015.00	-479.25	0.00

CASHFLOW WITH INTEREST RATE 12.000%

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-248276.79	-387310.79
3	93680.00	-323424.00	74681.12	-312629.66
4	178611.00	-144813.00	127131.78	-185497.88
5	64205.00	-80608.00	40803.44	-144694.44
6	86635.00	6027.00	49159.03	-95535.42
7	66295.00	72322.00	33587.11	-61948.31
8	81833.00	154155.00	37017.09	-24931.21
9	80308.00	234463.00	32435.05	7503.84
10	69668.00	304131.00	25122.98	32626.82
11	67008.00	371139.00	21574.78	54201.60
12	68338.00	439477.00	19645.54	73847.14
13	69668.00	509145.00	17882.04	91729.18
14	76318.00	585463.00	17490.12	109219.30
15	73658.00	659121.00	15071.89	124291.19
16	103296.00	762417.00	18871.79	143162.98
17	172111.00	934528.00	28075.03	171238.01
18	70998.00	1005526.00	10340.46	181578.47
19	92667.00	1098193.00	12050.38	193628.85
20	73658.00	1171851.00	8552.19	202181.04
21	79173.00	1251024.00	8207.61	210388.65
22	-24009.00	1227015.00	-2222.26	208166.39

CASHFLOW WITH INTEREST RATE IRR (Case 2)

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-152937.00	-152937.00	-152937.00	-152937.00
2	-305887.00	-458824.00	-262180.20	-415117.20
3	93680.00	-365144.00	68821.58	-346295.62
4	123376.00	-241768.00	77686.81	-268608.81
5	64205.00	-177563.00	34651.68	-233957.13
6	86635.00	-90928.00	40076.31	-193880.82
7	66295.00	-24633.00	26285.36	-167595.46
8	81835.00	57200.00	27809.97	-139785.49
9	80308.00	137508.00	23392.13	-116393.36
10	69668.00	207176.00	17393.35	-99000.01
11	67008.00	274184.00	14338.88	-84661.13
12	68338.00	342522.00	12534.00	-72127.13
13	69668.00	412190.00	10952.16	-61174.97
14	76318.00	488508.00	10283.29	-50891.67
15	73658.00	562166.00	8506.76	-42384.92
16	103296.00	665462.00	10225.07	-32159.84
17	172111.00	837573.00	14602.61	-17557.23
18	70998.00	908571.00	5163.06	-12394.18
19	92667.00	1001238.00	5775.97	-6618.21
20	73658.00	1074896.00	3935.12	-2683.09
21	79173.00	1154069.00	3625.39	942.30
22	-24009.00	1130060.00	-942.30	0.00

CASHFLOW WITH INTEREST RATE 16.671%

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-152937.00	-152937.00	-152937.00	-152937.00
2	-305887.00	-458824.00	-262180.20	-415117.20
3	93680.00	-365144.00	68821.58	-346295.62
4	123376.00	-241768.00	77686.81	-268608.81
5	64205.00	-177563.00	34651.68	-233957.13
6	86635.00	-90928.00	40076.31	-193880.82
7	66295.00	-24633.00	26285.36	-167595.46
8	81833.00	57200.00	27809.97	-139785.49
9	80308.00	137508.00	23392.13	-116393.36
10	69668.00	207176.00	17393.35	-99000.01
11	67008.00	274184.00	14338.88	-84661.13
12	68338.00	342522.00	12534.00	-72127.13
13	69668.00	412190.00	10952.16	-61174.97
14	76318.00	488508.00	10283.29	-50891.67
15	73658.00	562166.00	8506.76	-42384.92
16	103296.00	665462.00	10225.07	-32159.84
17	172111.00	837573.00	14602.61	-17557.23
18	70998.00	908571.00	5163.06	-12394.18
19	92667.00	1001238.00	5775.97	-6618.21
20	73658.00	1074896.00	3935.12	-2683.09
21	79173.00	1154069.00	3625.39	942.30
22	-24009.00	1130060.00	-942.30	0.00

CASHFLOW WITH INTEREST RATE 20.848% (Case 3)

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-125130.00	-125130.00	-125130.00	-125130.00
2	-250263.00	-375393.00	-207089.14	-332219.14
3	93680.00	-281713.00	64145.80	-268073.34
4	123376.00	-158337.00	69905.72	-198167.62
5	64205.00	-94132.00	30103.12	-168064.49
6	86635.00	-7497.00	33612.19	-134452.31
7	66295.00	58798.00	21283.59	-113168.72
8	81833.00	140631.00	21739.68	-91429.04
9	80308.00	220939.00	17654.04	-73774.99
10	69668.00	290607.00	12673.00	-61101.99
11	67008.00	357615.00	10086.34	-51015.66
12	68338.00	425953.00	8511.96	-42503.70
13	69668.00	495621.00	7180.61	-35323.08
14	76318.00	571939.00	6509.02	-28814.06
15	73658.00	645597.00	5198.40	-23615.66
16	103296.00	748893.00	6032.45	-17583.22
17	172111.00	921004.00	8317.24	-9265.97
18	70998.00	992002.00	2839.08	-6426.89
19	92667.00	1084669.00	3066.32	-3360.57
20	73658.00	1158327.00	2016.85	-1343.73
21	79173.00	1237500.00	1793.87	450.14
22	-24009.00	1213491.00	-450.14	0.00

CASHFLOW WITH INTEREST RATE 12.000%

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-125130.00	-125130.00	-125130.00	-125130.00
2	-250263.00	-375393.00	-223449.11	-348579.11
3	93680.00	-281713.00	74681.12	-273897.98
4	123376.00	-158337.00	87816.60	-186081.38
5	64205.00	-94132.00	40803.44	-145277.95
6	86635.00	-7497.00	49159.03	-96118.92
7	66295.00	58798.00	33587.11	-62531.81
8	81833.00	140631.00	37017.09	-25514.72
9	80308.00	220939.00	32435.05	6920.34
10	69668.00	290607.00	25122.98	32043.32
11	67008.00	357615.00	21574.78	53618.10
12	68338.00	425953.00	19645.54	73263.64
13	69668.00	495621.00	17882.04	91145.68
14	76318.00	571939.00	17490.12	108635.80
15	73658.00	645597.00	15071.89	123707.68
16	103296.00	648893.00	18871.79	142579.48
17	172111.00	921004.00	28075.03	170654.51
18	70998.00	992002.00	10340.46	180994.97
19	92667.00	1084669.00	12050.38	193045.34
20	73658.00	1158327.00	8552.19	201597.54
21	79173.00	1237500.00	8207.61	209805.15
22	-24009.00	1213491.00	-2222.26	207582.88

CASHFLOW WITH INTEREST RATE 22.339% (Case 4)

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-227295.56	-366329.56
3	106804.00	-310300.00	71361.04	-294968.52
4	187805.00	-122495.00	102569.35	-192399.17
5	73903.00	-48592.00	32992.05	-159407.12
6	91383.00	42791.00	33346.44	-126060.68
7	71043.00	113834.00	21190.55	-104870.13
8	86557.00	200391.00	21103.76	-83766.36
9	87132.00	287523.00	17364.90	-66401.47
10	72992.00	360515.00	11890.68	-54510.79
11	70332.00	430847.00	9365.29	-45145.50
12	71662.00	502509.00	7799.99	-37345.51
13	74392.00	576901.00	6618.63	-30726.88
14	83142.00	660043.00	6046.43	-24680.45
15	76982.00	737025.00	4576.20	-20104.25
16	106620.00	843645.00	5180.73	-14923.52
17	175435.00	1019080.00	6967.96	-7955.57
18	75722.00	1094802.00	2458.37	-5497.19
19	99491.00	1194293.00	2640.26	-2856.93
20	76982.00	1271275.00	1669.89	-1187.04
21	82497.00	1353772.00	1462.76	275.72
22	-19024.00	1334748.00	-275.72	0.00

CASHFLOW WITH INTEREST RATE 12.000%

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-248276.79	-387310.79
3	106804.00	-310300.00	85143.49	-302167.29
4	187805.00	-122495.00	133675.89	-168491.40
5	73903.00	-48592.00	46966.69	-121524.71
6	91383.00	42791.00	51853.17	-69671.54
7	71043.00	113834.00	35992.59	-33678.95
8	86557.00	200391.00	39153.99	5475.05
9	87132.00	287523.00	35191.15	40666.20
10	72992.00	360515.00	26321.65	66987.85
11	70332.00	430847.00	22645.02	89632.87
12	71662.00	502509.00	20601.11	110233.98
13	74392.00	576901.00	19094.57	129328.55
14	83142.00	660043.00	19054.00	148382.55
15	76982.00	737025.00	15752.04	164134.60
16	106620.00	843645.00	19479.08	183613.67
17	175435.00	1019080.00	28617.25	212230.92
18	75722.00	1094802.00	11028.48	223259.40
19	99491.00	1194293.00	12937.77	236197.17
20	76982.00	1271275.00	8938.13	245135.30
21	82497.00	1353772.00	8552.20	253687.50
22	-19024.00	1334748.00	-1760.85	251926.65

CASHFLOW WITH INTEREST RATE 18.762% (Case 5)

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-234150.29	-373174.29
3	80497.00	-336607.00	57072.08	-316102.21
4	169417.00	-167190.00	101140.02	-214962.19
5	58507.00	-108683.00	29410.06	-185552.13
6	81887.00	-26796.00	34659.72	-150892.41
7	61547.00	34751.00	21935.07	-128957.34
8	77110.00	111861.00	23140.08	-105817.26
9	73485.00	185346.00	18568.41	-87248.85
10	66345.00	251691.00	14115.83	-73133.02
11	63685.00	315376.00	11409.26	-61723.76
12	65015.00	380391.00	9807.44	-51916.32
13	64945.00	445336.00	8249.16	-43667.16
14	69495.00	514831.00	7432.58	-36234.58
15	70335.00	585166.00	6334.02	-29900.55
16	99973.00	685139.00	7580.76	-22319.79
17	168788.00	853927.00	10776.90	-11542.89
18	62951.00	916878.00	3384.36	-8158.53
19	85844.00	1002722.00	3886.03	-4272.49
20	67011.00	1069733.00	2554.26	-1718.24
21	75850.00	1145583.00	2434.42	716.18
22	-26501.00	1119082.00	-716.18	0.00

CASHFLOW WITH INTEREST RATE 12.000%

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-248276.79	-387310.79
3	80497.00	-336607.00	64171.72	-323139.07
4	169417.00	-167190.00	120587.67	-202551.40
5	58507.00	-108683.00	37182.26	-165369.14
6	81887.00	-26796.00	46464.88	-118904.26
7	61547.00	34751.00	31181.63	-87722.63
8	77110.00	111861.00	34880.65	-52841.98
9	73485.00	185346.00	29679.36	-23162.62
10	66345.00	251691.00	23924.67	762.05
11	63685.00	315376.00	20504.87	21266.91
12	65015.00	380391.00	18690.26	39957.17
13	64945.00	445336.00	16669.76	56626.94
14	69495.00	514831.00	15926.46	72553.40
15	70335.00	585166.00	14391.93	86945.33
16	99973.00	685139.00	18264.69	105210.02
17	168788.00	853927.00	27532.98	132743.00
18	62951.00	916878.00	9168.46	141911.46
19	85844.00	1002722.00	11163.12	153074.58
20	67011.00	1069733.00	7780.43	160855.01
21	75850.00	1145583.00	7863.12	168718.13
22	-26501.00	1119082.00	-2452.92	166265.21

CASHFLOW WITH INTEREST RATE 17.264% (Case 6)

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-237131.32	-376165.32
3	68745.00	-348359.00	49993.17	-326172.15
4	161142.00	-187217.00	99933.96	-226238.19
5	53379.00	-133838.00	28229.92	-198008.27
6	77614.00	-56224.00	35003.70	-163004.57
7	57274.00	1050.00	22027.55	-140977.02
8	72858.00	73908.00	23895.76	-117081.26
9	67343.00	141251.00	18835.22	-98246.04
10	63353.00	204604.00	15110.55	-83135.49
11	60723.00	265327.00	12350.97	-70784.52
12	62023.00	327350.00	10758.10	-60026.42
13	60693.00	388043.00	8977.51	-51048.91
14	63353.00	451396.00	7991.34	-43057.57
15	67343.00	518739.00	7244.02	-35813.55
16	97171.00	615910.00	8913.71	-26899.84
17	165796.00	781706.00	12969.72	-13930.12
18	62023.00	843729.00	4137.56	-9792.56
19	79703.00	923432.00	4534.20	-5258.36
20	67343.00	990775.00	3267.03	-1991.33
21	72858.00	1063633.00	3014.21	1022.88
22	-28993.00	1034640.00	-1022.88	0.00

CASHFLOW WITH INTEREST RATE 12.000%

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-248276.79	-387310.79
3	68745.00	-348359.00	54803.09	-332507.69
4	161142.00	-187217.00	114697.69	-217810.00
5	53379.00	-133838.00	33923.32	-183886.68
6	77614.00	-56224.00	44040.27	-139846.41
7	57274.00	1050.00	29016.79	-110829.62
8	72858.00	73908.00	32957.26	-77872.36
9	67343.00	141251.00	27198.71	-50673.65
10	63353.00	204604.00	22845.73	-27827.93
11	60723.00	265327.00	19551.18	-8276.75
12	62023.00	327350.00	17830.13	9553.38
13	60693.00	388043.00	15578.38	25131.77
14	63353.00	451396.00	14518.87	39650.64
15	67343.00	518739.00	13779.71	53430.35
16	97171.00	615910.00	17752.78	71183.13
17	165796.00	781706.00	27044.92	98228.05
18	62023.00	843729.00	9033.30	107261.35
19	79703.00	923432.00	10364.55	117625.89
20	67343.00	990775.00	7818.98	125444.87
21	72858.00	1063633.00	7552.95	132997.82
22	-28993.00	1034640.00	-2683.58	130314.24

CASHFLOW WITH INTEREST RATE 21.300% (Case 7)

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-229242.04	-368276.04
3	96368.00	-320736.00	65495.75	-302780.29
4	181954.00	-138782.00	101948.77	-200831.52
5	68488.00	-70294.00	31635.52	-169196.00
6	89978.00	19684.00	34263.92	-134932.08
7	69585.00	89269.00	21845.22	-113086.86
8	85176.00	174445.00	22044.39	-91042.47
9	83651.00	258096.00	17848.11	-73194.36
10	73011.00	331107.00	12842.50	-60351.86
11	70351.00	401458.00	10201.68	-50150.18
12	71681.00	473139.00	8569.30	-41580.88
13	70040.00	543179.00	6902.84	-34678.04
14	79659.00	622838.00	6472.27	-28205.77
15	77001.00	699839.00	5157.73	-23048.04
16	106639.00	806478.00	5888.68	-17159.36
17	175454.00	981932.00	7987.40	-9171.96
18	74341.00	1056273.00	2790.04	-6381.92
19	96010.00	1152283.00	2970.56	-3411.36
20	82516.00	1234799.00	2104.75	-1306.61
21	79173.00	1313972.00	1664.87	358.26
22	-20666.00	1293306.00	-358.26	-0.00

CASHFLOW WITH INTEREST RATE 12.000%

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-248276.79	-387310.79
3	96368.00	-320736.00	76823.98	-310486.81
4	181954.00	-138782.00	129511.26	-180975.54
5	68488.00	-70294.00	43525.36	-137450.18
6	89978.00	19684.00	51055.93	-86394.25
7	69585.00	89269.00	35253.93	-51140.32
8	85176.00	174445.00	38529.30	-12611.02
9	83651.00	258096.00	33785.24	21174.21
10	73011.00	331107.00	26328.50	47502.71
11	70351.00	401458.00	22651.14	70153.85
12	71681.00	473139.00	20606.57	90760.42
13	70040.00	543179.00	17977.52	108737.95
14	79659.00	622838.00	18255.79	126993.73
15	77001.00	699839.00	15755.93	142749.66
16	106639.00	806478.00	19482.55	162232.21
17	175454.00	981932.00	28620.35	190852.56
18	74341.00	1056273.00	10827.35	201679.91
19	76010.00	1152283.00	12485.10	214165.01
20	82516.00	1234799.00	9580.67	223745.67
21	79173.00	1313972.00	8207.61	231953.28
22	-20666.00	1293306.00	-1912.84	230040.45

CASHFLOW WITH INTEREST RATE 19.676% (Case 8)

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-232352.15	-371386.15
3	90992.00	-326112.00	63531.39	-307854.76
4	175268.00	-150844.00	102254.00	-205600.76
5	60862.00	-89982.00	29669.93	-175930.84
6	83292.00	-6690.00	33928.61	-142002.23
7	62952.00	56262.00	21427.17	-120575.05
8	78490.00	154752.00	22323.50	-98251.55
9	76965.00	211717.00	18290.84	-79960.71
10	66325.00	278042.00	13170.74	-66789.97
11	63665.00	341707.00	10563.95	-56226.02
12	64995.00	406702.00	9011.52	-47214.49
13	66325.00	473027.00	7684.01	-39530.48
14	72975.00	546002.00	7064.43	-32466.05
15	70315.00	616317.00	5687.79	-26778.26
16	99953.00	716270.00	6755.92	-20022.34
17	168768.00	885038.00	9531.72	-10490.63
18	67655.00	952693.00	3192.81	-7297.81
19	89324.00	1042017.00	3522.36	-3775.45
20	70315.00	1112332.00	2316.90	-1458.55
21	75830.00	1188162.00	2087.82	629.26
22	-27352.00	1160810.00	-629.26	0.00

CASHFLOW WITH INTEREST RATE 12.000%

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-248276.79	-387310.79
3	90992.00	-326112.00	72538.27	-314772.52
4	175268.00	-150844.00	124752.30	-190020.22
5	60862.00	-89982.00	38678.90	-151341.32
6	83292.00	-6690.00	47262.12	-104079.20
7	62952.00	56262.00	31893.44	-72185.76
8	78490.00	134752.00	35504.89	-36680.87
9	76965.00	211717.00	31084.87	-5596.00
10	66325.00	278042.00	23917.46	18321.46
11	63665.00	341707.00	20498.43	38819.89
12	64995.00	406702.00	18684.51	57504.40
13	66325.00	473027.00	17023.98	74528.37
14	72975.00	546002.00	16723.99	91252.36
15	70315.00	616317.00	14387.84	105640.20
16	99953.00	716270.00	18261.04	123901.24
17	168768.00	885038.00	27529.72	151430.96
18	67655.00	952693.00	9853.57	161284.53
19	89324.00	1042017.00	11615.66	172900.18
20	70315.00	1112332.00	8164.05	181064.23
21	75830.00	1188162.00	7861.05	188925.28
22	-27352.00	1160810.00	-2531.69	186393.59

CASHFLOW WITH INTEREST RATE 11.525% (Case 9)

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-249333.92	-388367.92
3	66802.00	-350302.00	53708.61	-334659.31
4	145180.00	-205122.00	104661.86	-229997.44
5	30774.00	-174348.00	19892.66	-210104.78
6	53204.00	-121144.00	30837.59	-179267.20
7	32864.00	-88280.00	17079.84	-162187.36
8	48402.00	-39878.00	22555.57	-139631.78
9	46877.00	6999.00	19587.44	-120044.35
10	36237.00	43236.00	13576.79	-106467.55
11	33577.00	76813.00	11280.13	-95187.42
12	34907.00	111720.00	10515.07	-84672.36
13	36237.00	147957.00	9787.66	-74884.70
14	42887.00	190844.00	10386.75	-64497.95
15	40227.00	231071.00	8735.72	-55762.23
16	69865.00	300936.00	13604.04	-42158.18
17	138680.00	439616.00	24213.05	-17945.14
18	37567.00	477183.00	5881.25	-12063.89
19	59236.00	536419.00	8315.26	-3748.63
20	40227.00	576646.00	5063.31	1314.68
21	45742.00	622388.00	5162.49	6477.17
22	-64005.00	558383.00	-6477.17	-0.00

CASHFLOW WITH INTEREST RATE 12.000%

PERIOD	CASHFLOW	CUM FLOW	NET PV	CUM NET PV
1	-139034.00	-139034.00	-139034.00	-139034.00
2	-278070.00	-417104.00	-248276.79	-387310.79
3	66802.00	-350302.00	53254.15	-334056.64
4	145180.00	-205122.00	103336.26	-230720.38
5	30774.00	-174348.00	19557.43	-211162.95
6	53204.00	-121144.00	30189.38	-180973.57
7	32864.00	-88280.00	16649.93	-164323.65
8	48402.00	-39878.00	21894.61	-142429.04
9	46877.00	6999.00	18932.83	-123496.21
10	36237.00	43236.00	13067.43	-110428.78
11	33577.00	76813.00	10810.90	-99617.89
12	34907.00	111720.00	10034.93	-89582.96
13	36237.00	147957.00	9301.14	-80281.82
14	42887.00	190844.00	9828.59	-70453.23
15	40227.00	231071.00	8231.24	-62221.99
16	69865.00	300936.00	12764.07	-49457.91
17	138680.00	439616.00	22621.71	-26836.20
18	37567.00	477183.00	5471.42	-21364.78
19	59236.00	536419.00	7703.03	-13661.75
20	40227.00	576646.00	4670.63	-8991.13
21	45742.00	622388.00	4741.93	-4249.20
22	-64005.00	558383.00	-5924.28	-10173.48